Editor
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Business Manager
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INDIA RUBBER WORLD

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Volume 96 **New York, May 1, 1937** **Number 2**

Pre-Vulcanization Rubber Developments in the United States

Everett G. Holt

WHEN knowledge of rubber first reached the American Colonies is uncertain, but trading between the Colonies and the West Indies, where it was occasionally encountered, may have resulted in fairly early acquaintance with the material among merchants and seafaring men. In 1740 Lawrence Washington, eldest brother of George, served as an officer in the unsuccessful British expedition against Carthagena (where rubber was commonly known), under Admiral Vernon, for whom Mount Vernon was later named, in which expeditionary forces were thirty sail of the line and 15,000 sailors, with land forces numbering 12,000 including many Colonials; it is possible that rubber was known to the Washington family and others. In 1751, George Washington himself spent some time in Barbados with his invalid brother Lawrence. Considering the scientific bent of Benjamin Franklin, it is practically certain that while in Paris during the Revolutionary War, he must have learned of rubber, which was in use there for erasers steadily after 1775. From 1800 on india rubber bottles were imported into the United States in small quantities, commonly being cut in pieces for use as erasers.

Possibly Franklin first made rubber known to other Philadelphians. It is, at any rate, a fact that the first rubber patent applied for in this country was by a Philadelphian, Jacob F. Hummel, for a varnish of gum elastic to render leather shoes waterproof, in 1813. Also, Professor J. K. Mitchell, also of Philadelphia, pointed out in the infancy of the industry that by immersing rubber bags in common ether one could blow them into thin balloons, light enough to float in the air; in this state rubber could also be stretched over forms and, when dried, did not return to its original shape; it could likewise be rolled or pressed into sheets of any size and degree of tenuity, and these sheets cut into threads.

Americans participated in the universal early search for an inexpensive rubber solvent, but it was from other causes than this that the industry first got under way in New England. The early English and French manufacturers, aside from seeking a means of restoring rubber to its native state by solutions, confined their manufacturing activities to lines for which rubber was adaptable in its raw form; but the early Americans tried to use it for purposes for which it was then unsuited, and this stimulated experiment for remedying the defects inherent in the raw material.

Leather Industry Background

The leather footwear industry started in the American Colonies with the arrival of Thomas Beard, an accredited shoemaker, on the Mayflower in 1629, the second year of the settlement of Massachusetts. In 1635 the Lynn industry was founded by Philip Kertland. No inconsiderable part of the boots and shoes worn in the country when the Revolution began was of domestic manufacture, chiefly the production of Massachusetts. In 1810 the census recorded an aggregate production of 5,035,371 pairs of which 2,218,671 pairs were made in Massachusetts, 1,327,776 pairs in Pennsylvania, and a total of 1,489,924 in nine other states. Massachusetts continued to supply nearly half the production thereafter, until the dawn of the twentieth century.

The importation of a single pair of shoes made of rubber in 1820, at Boston, the center of the Massachusetts

shoe industry, therefore attracted unusual attention. These shoes were gilded, and had long pointed toes "like those of the Mandarin of China." In 1823 a lot of 500 pairs of original Para rubber shoes was brought into Boston and sold at high prices; they were soon after imported in large quantities, and the American commerce in rubber dates from that year. These shoes came from Para, Brazil, the port having first been opened to other than Portugese vessels about 1822. The 1823 rubber shoe imports, although thick, heavy, and ill-shaped, found a ready market.

In 1825 Thomas C. Wales, a Boston merchant, began importation of rubber shoes from Para and soon after aided in improving the fit of such shoes by shipping American lasts to Para for use by the Indians there as molds in making the shoes for the United States market. As a result, a really large trade grew up in such shoes, which were imported into Salem, Boston, and New York—until about 1845 the United States annually imported from Brazil about as many *pairs* of rubber shoes as the total number of *pounds* of rubber exported from Brazil in all other forms to all markets combined. This trade, therefore, lent great support to the demand for rubber in this period, and, natually, the rubber shoes came to the early attention of a very large number of persons in New England, spreading knowledge about rubber and stimulating study of ways to improve the material—for in the extremes of climate to which New England is more subject than Great Britain, rubber goods became hard and brittle in cold weather, and in warm weather became soft and sticky.

In 1831 George H. Richards, of Washington, D. C., obtained a patent for a fluid caoutchouc to render articles waterproof, and in 1832, Wait Webster, of New York, received a patent for attaching soles to gum elastic boots and shoes. In 1833 patents for similar objects were issued to Nathaniel Ruggles, Bridgeport, Conn., and Samuel D. Breed, of Philadelphia; while J. M. Hood, of Wall Street, exhibited at the fair of the American Institute in New York shoes made of leather which had been sent to South America and covered with rubber from latex by the Indians there. A certain amount of experimentation took place regularly among men in the medical profession.

The First American Rubber Factory

Since interest in rubber was so rapidly spreading, particularly its use in connection with shoes, it is hardly a matter of surprise that the first noteworthy rubber manufacturing establishment started in the United States was by a leather manufacturer, seeking initially to develop a waterproof finish for leather. This firm, the Roxbury India-Rubber Co., was founded by Edwin M. Chaffee, of Roxbury, Mass., with John Haskins and others, in 1832; the company was incorporated with a capital of $300,000 in 1833 and soon began to manufacture articles of common use from cloth, treated with rubber dissolved or suspended in one of the essential oils, of which spirits of turpentine was found the cheapest, although the solvent used was kept secret as long as possible. Products made by the company during the next two or three years included waterproof clothing, shoes, hose, life preservers, and carriage traces. In 1834 Mr. Chaffee took out a patent for manufacturing india-rubber hose (hose had previously always been made of leather), and another for making boots and shoes of india-rubber leather, the finish for which consisted of rubber solution in which lampblack was mixed.

The establishment of this company attracted considerable attention, and in 1834 several additional firms started manufacturing attempts. During a visit of President Jackson to Boston in June, 1833, the managers of the Roxbury company, realizing the value of advertising, arranged for him to visit their plant. They presented him with a suit of rubber clothing, which he wore that rainy day while riding through the streets of Boston on horseback. This clever publicity naturally centered increased attention on their undertaking, and shares in the company's stock, originally selling at $100, went up to $300 and later $400. The capitalization of the Roxbury company was increased to $400,000. Six other rubber companies were chartered in Massachusetts that same year, and others were started in New York City and Staten Island, in Troy, Providence, and elsewhere. These factories started with capitals ranging from $50,000 to $500,000. One of these was the Eagle Rubber Co., Woburn, Mass., of which more later. With the impetuosity and daring characteristic of American enterprise then as now, and with the rapid advance in values of shares of these companies inducing speculation, it resulted that an amount of capital unusual and imposing for the time, possibly in excess of $5,000,000 including the peak prices paid for shares by unwary investors, became involved in these enterprises. Around Boston, in 1834, it was generally considered a want of sagacity for anyone not to own more or less rubber stock.

India Rubber Boom and Panic

W. H. Richardson, in his "Boot and Shoe Manufacturers Guide", published 1858, writing in this connection, states: "Millions of dollars were expended for mills, machinery and the production of goods. No sooner had the possibility of manufacturing boots and shoes from india rubber been demonstrated, than the attention of capitalists and inventors was drawn to the new field of enterprise. The anxious speculator and enthusiastic manufacturer plunged boldly into the sea of trade. All classes became interested in its success; stock companies were formed, the shares of which were eagerly snatched up and visions of untold profits divided in anticipation, but the bubble soon burst; goods manufactured in April became a sticky mass of useless rubbish in July. The warm weather literally melted hopes and expectations.

"A panic was the consequence, mills were abandoned, thousands of artisans suddenly thrown out of employment, tons of india rubber, raw and prepared, were either given away or sold at ruinous sacrifices. Hilltops blazed with its ignited masses, and the illuminations of the Fourth of July succeeding the failure were rendered unusually brilliant by the aid of the india rubber panic. The cause of the great loss of money and material originated in the indecent haste of the manufacturer."

The real cause was that rubber goods made with the use of turpentine, would decompose quickly in warm weather. Considering that these events had occurred twenty-odd years before Richardson wrote so indignantly, it is certain that the india rubber boom and panic of 1833-1835 occasioned widespread heavy financial losses, long-remembered in New England and New York. Nearly all these early factories came to an end calamitous to the investors.

Solarization Discovered by Hayward

These events originally gave to rubber manufacture the reputation of an undertaking dangerous from an investment standpoint. But at the same time the knowledge of rubber was extended materially, and the experience was not without incidental important benefits. Charles Goodyear, who had prior to this time turned to invention as a

means of livelihood, had his attention centered on rubber as a result of a visit to the New York warehouse of the Roxbury company in 1834, the agent there telling him he could be sure of a large fortune if he could find a way of preparing rubber so as to remedy its adhesiveness and prevent its decomposition after manufacture. From that time on Goodyear devoted his life to the task of finding a remedy for the adhesiveness of rubber, for its liability to deterioration and to changes in temperature, and to the application of his processes to all varieties of products and uses.

Also, at the Eagle Rubber Co., Woburn, one Nathaniel Hayward, previously interested in rubber in connection with attempts to make a waterproof blacking, and now employed as foreman in the factory, about the year 1835, after repeated experiments, began to use sulphur with rubber in order to remove its adhesiveness, and found that upon exposing cloth covered with a thin sheet of rubber solution combined with sulphur to the rays of the sun, the surface became dried more completely than by any other known combination. The surface cure was, however, not satisfactory or dependable, and the sulphur, moreover, was found to impart to the goods an offensive odor which rendered them unpopular. This process was used also by the Roxbury company about the same time. Hayward subsequently claimed that the idea of using sulphur with rubber came to him in a dream. The process of curing an exposed rubber surface of adhesiveness by combining sulphur with the rubber and subjecting it to the ultra-violet rays of the sun became known as "solarization".

Chaffee Invents First Rubber Calender

Great progress had been made also in the mechanical treatment of raw rubber. On August 31, 1836, Chaffee took out a patent covering machinery used in applying undissolved rubber to cloth, leather, and other articles. This invention consisted of a machine for preparing or grinding the rubber, and another machine for coating the cloth with rubber. The grinding machine consisted of two hollow cylinders, heated by steam or otherwise, coming in contact on one side, one rolling faster than the other, imparting a rolling and slipping motion. Rubber in small pieces passed through these rollers was softened and changed into shreds and then sheets, being reduced to a plastic condition as in Hancock's masticator.

The invention of this machine resuscitated the Roxbury company and caused its stock to advance to par, after nearly the entire capital had been sunk in fruitless attempts to manufacture rubber goods with solvents. It was supposed that the solvents being dispensed with, the difficulties of manufacture due to adhesiveness and decomposition of the goods would also be surmounted. But as adhesiveness is an inherent quality of rubber, the idea was unsound, and the goods lacked durability; the stock again declined in value and the manufacture of rubber goods was abandoned by the company in 1837.

Salem—Leading American Rubber Port

While these events were taking place, the import trade in unvulcanized rubber shoes continued. As will appear in a later article, the United States official import statistics did not report imports of rubber, or of rubber shoes, as specific items of commerce in those years, but analysis of available data indicates that imports increased gradually but steadily from 1823 to 1832, then for about three years the imports of rubber and shoes were at an increased level. While the early attempts at manufacture were in part responsible, it is certain that the trade in rubber shoes was also highly important at the time.

During this period historic Salem was the leading American port of entry for rubber in the form of shoes and continued to hold this position of leadership until after 1840, when it was succeeded by New York; Boston ranked third among ports of entry, and it appears that no entries of shoes were made except at these three ports. Probably the import trade in shoes was diminished somewhat in 1834-1837 as a result of the competition from the goods made of cloth and rubber by the early manufacturers, but the imports increased again subsequently. And importation of finished goods is usually more stimulative to invention in domestic industry than the importation of raw materials.

Goodyear's Start in Rubber Invention

Within two years after Goodyear in 1834 began his rubber career, he made discoveries which, at the time he believed would solve the difficulties of rubber manufacture. The wonderful and mysterious properties of the substance had made a strong impression on his mind while yet a schoolboy, about 1815. He had without any comprehension of the magnitude of the task undertaken to solve the mysteries of rubber compounding and manufacture, under the following adverse circumstances: without financial means and heavily in debt, with a family to support, with no training as a chemist—and indeed chemistry was then in its infancy, with no practical experience in rubber manufacturing, with no mechanical inclination, at a time when there was no rubber literature worthy of mention in the English language.

His first object was to cure rubber of its adhesiveness, and there was no certainty that any such remedy existed or could be produced. That he eventually succeeded is explained, considering the trials to which he was subjected, only by the great genius he undoubtedly possessed, coupled with a religious and almost fanatical faith in his ultimate success, and a natural facility for being keenly and accurately observant. He felt that he was a man with a philanthropic mission to perform for the benefit of humanity, and he pursued his objective unswervingly.

In his own words: "From the time my attention was first given to the subject, a strong and abiding impression was made upon my mind, that an object so desirable and important, and so necessary to man's comfort as the making of gum-elastic available to his use, was most certainly placed within my reach. The creature may imagine he is only executing some plan of his own, while he is the instrument in the hands of his Maker. . . . I was encouraged in my efforts by the reflection that what is hidden and unknown, and cannot be discovered by scientific research, will most likely be discovered by accident, if at all, and by the man who applies himself most perseveringly to the subject, and is most observing of every thing relating thereto."

His first rubber patent, for a cement, obtained in September, 1835, was of little importance.

In his "Gum Elastic," Goodyear frequently refers to rubber in connection with leather, and his first noteworthy discovery is mentioned as a means of "tanning" the gum. By boiling articles of rubber compounded with magnesia in quick lime and water, the viscous property of the surface appeared to be destroyed. He made by this method some fancy articles and sheets of rubber, for which, in the Autumn of 1835, he obtained medals at the New York fairs of the Mechanics and American Institutes. The surface of the articles was quite dry, and the cure of adhe-

(*Continued on page* 46)

Buried Telephone Wire

D. A. Quarles[1]

THE urge to put telephone lines under ground is only a little younger than the business itself. In some measure this has been realized by installing lead-covered cables in conduit that had previously been placed in the ground. As a further move in this direction, the Bell system some years ago buried its first tape-armored toll cable[2] directly in the ground; and where conditions have been favorable, this practice has since been extended to large and small exchange-area cables and to one and two-pair entrance cables for underground service connections. All such cables, however, have been lead covered and protected from sheath corrosion by successive layers of paper and jute impregnated with asphalts. In the armored form, steel tapes are added as a provision against interference from outside electrical sources.

Primarily in the interest of providing a lower cost type of plant and thereby making possible a more extensive use of service in rural communities the development of an inexpensive form of buried circuit was undertaken.

Experience with cable burial had led to the development of a cable-laying plow, the neat operation of which in plowing cable into the ground at depths ranging up to 30 inches without trenching or backfilling in the ordinary sense has been described elsewhere. The adaptation of this method to the burial of wire at an appropriate depth required that it be simplified so that it would be less expensive.

On the point of serviceability, it remained for the research chemists to solve an important part of the problem by the development in Bell Telephone Laboratories of a rubber compound that could be used to insulate a pair of wires and could be relied on to maintain suitable insulating properties over a period of years under the severe moisture conditions that are encountered under ground.

With these fundamentals in hand, the development engineers undertook to study the mechanical and electrical problems involved and to design a wire that would have appropriate transmission and handling characteristics. In addition, they had to devise methods of splicing the wire; to adapt plow equipment to its installation; to develop loading arrangements for use on the longer lengths; to study methods of tracing the path of the wire for the purpose of locating faults. In short, the job was to develop buried wire as a practicable plant instrumentality.

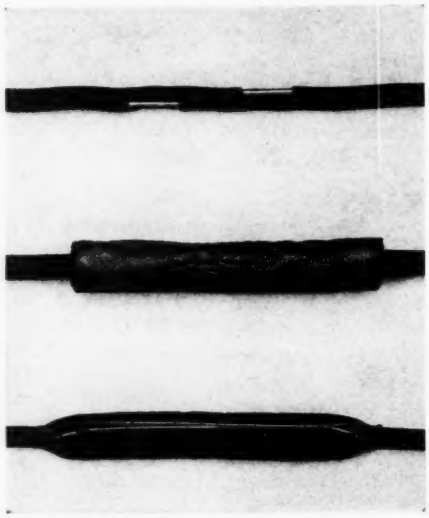

Fig. 1. Splicing Buried wire. (*Top*) Pressed Sleeve Joints in Conductors; (*Center*) with the Unvulcanized Rubber Pad in Place; (*Bottom*) the Splice after Vulcanization

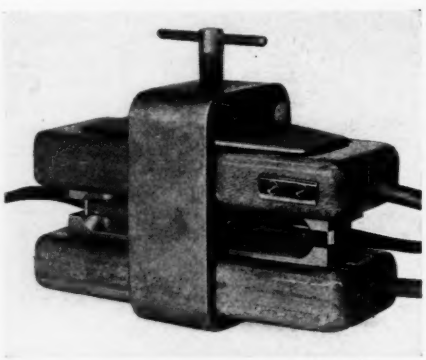

Fig. 2. Vulcanizer for Buried Wire Splice. The Buried Wire Is in the Center, and Storage Battery Leads for Heating Vulcanizer Are above and below on Right

The Insulated Wire

The wire, as actually made, employs annealed copper conductors, insulated in parallel twin construction with the special rubber compound. The wire is adapted to a continuous process of extrusion and vulcanization by the Western Electric method. In common with most high-grade rubber insulating compounds, however, the insulation is quite sensitive to sunlight so that it must be carefully guarded from any unnecessary exposure to direct rays of the sun and from any extended exposure to indirect rays.

Splicing

One of the principal problems in using a wire of this kind is that of splicing, since the splice must be essentially as resistant to water absorption as the wire itself. In the splice as actually developed, Figure 1, the conductor joint is made by pressing a cylindrical sleeve on the abutted ends of the wires to be joined, in this way producing a tight joint of high electrical efficiency which is relatively immune to corrosion. The joints in the two wires are staggered, and the whole is encased in a pad of unvulcanized rubber which is pressed in place and vulcanized in an electrically heated mold, as shown in Figure 2. The vulcanizer is equipped with a thermostatic device to insure proper control of the temperature. This splice is intended for burial directly in the ground without other protection; and tests indicate it to be the equivalent of the unspliced wire.

Loading

While the transmission requirements to be placed on a buried circuit will depend upon the facilities with which it is associated, it is expected that buried circuits up to about five miles in length will, in general, not require loading. Where loading is necessary, provision has been made for it in the form of a permalloy dust-core coil which is individually potted with rubber insulated lead-out wires. It is intended to be spliced into the wire

[1] Outside plant development director, Bell Telephone Laboratories, Inc., 463 West St., New York, N. Y.

[2] *Bell Lab. Record*, June, 1930, p. 465.

at 8,000-foot intervals and buried directly in the ground with the wire.

The potting arrangement for the buried wire coil, Figure 3, has several features of interest. The loading coil is first potted in a small metal container which is vacuum impregnated with a moisture-resistant compound. The lead-out wires from this container are then spliced to stub lengths of the buried wire, as shown in the illustration. This container is then placed in a larger sheet copper container, from which the rubber insulated wires are brought out through tubes soldered into the copper container and pressed down into intimate contact with the rubber insulation. The lead-out wires are taped for reenforcement at the outer ends of the tubes. This outer can is then filled with a moistureproof compound and given a dip coating of moistureproof enamel. The operation of splicing the loading coil into the line wire then involves making two line wire splices.

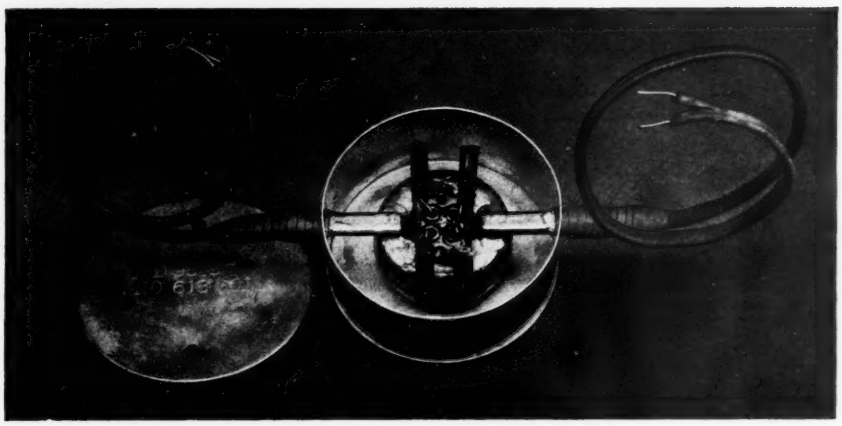

Fig. 3. Load Coil for Buried Wire before Filling Outer Case, Showing the Splicing of the Rubber Covered Stubs to the Lead-out Wires from the Inner Case

Plowing-in Operation

As mentioned above, the success of buried wire is in considerable measure dependent upon the efficiency of the equipment provided for plowing it into the ground. The choice of depth may be influenced somewhat by the local conditions, but in general it is felt that depths between 16 and 20 inches should be adequate for normal locations and that shallower installations are only justified under special circumstances.

The plow equipment which has been developed for this purpose is shown in Figure 4. The plowshare, which is shown in Figure 5, is a vertical blade with a tube fastened to the back edge through which one or two pairs of wires may be fed into the soil. The depth of the blade in the ground is adjustable to meet local conditions. It has been found that in fairly hard soil with a liberal supply of rock, an equivalent of a 40 or 50 h.p. caterpillar tractor is required to draw the plow. Under favorable conditions, the plow may be operated at a speed of three or four miles an hour, but a much lower average is to be expected.

Fig. 4. Cable Laying Plow Equipment

One consideration of some importance in installing wire of this type is the possibility of the insulation being crushed by boulders displaced by the plow, particularly where the trench with wire in place is to be rolled down or subjected to heavy traffic. This danger is, in fact, of such importance that buried telephone wire of this type is probably not a serviceable form of construction for use through a terrain where nested boulders are frequently encountered.

While it is generally possible to plow across gravel highways, this method can not be used when hard surface highways are encountered, and in such cases it becomes necessary either to use a pipe pushed under the roadway or to span the highway with open wire. Where conditions are such as to require routing the wire through or over culverts, across ditches, streams, and the like, involving actual or potential exposure of the wire as by soil erosion, iron pipe, or equivalent protection against mechanical injury and light will generally be required.

Interference

As in the case of other types of telephone circuits, the problem of avoiding noise and crosstalk must be considered. When more than one pair is laid in the same trench, experience has shown that twisting the wires every few feet, either in the process of removing the wire from the reels or by having it pretwisted, will reduce crosstalk to satisfactorily low values.

Special care must be given the wire in manufacture to assure a good degree of balance between the capacitances of the two conductors to ground. This is important in order to avoid noise in the buried-wire circuits when they are exposed to power circuits or when the connected open wire is exposed.

Maintenance

Though records are kept of wire routes, it will at times

be desirable to have fairly precise methods of tracing the underground path. Experiments have indicated that this may be done with considerable precision by putting a tone current on the wire and following along the surface of the ground with an exploring coil device described in another article.[3]

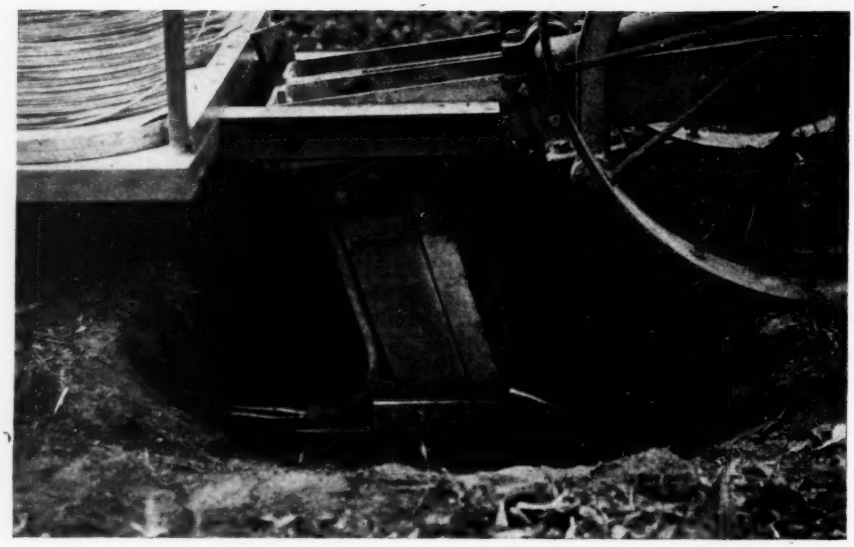

Fig. 5. Wire Plow with Ground Cut Away to Show Wire Passing through Plowshare

Since only a few hundred miles of buried wire circuits of the type described have actually been installed and put into service, it is recognized that many problems may yet arise and that this type of plant should still be considered as in a trial stage. It is, for example, not known to what extent burrowing rodents such as gophers may cause difficulties. Soil erosion may also introduce problems not as yet clearly visualized. On the other hand there should be avoided, by placing the wire underground, many troubles due to wind, ice, and tree interference which are peculiar to open wire construction, involving such things as broken insulators, broken poles, and crossed or broken wires. Buried wire should also, in general, be free from lightning troubles when properly protected at its junctions with exposed circuits. Considerations of this kind will be largely controlling in determining the eventual field of use for the buried type circuit, but present indications are that many locations may be found where this type of construction will prove economical.

[3] *Ibid.*, Aug., 1936, p 382.

Pre-Vulcanization Rubber Developments

(*Continued from page* 43)

siveness was thought to be complete; prior to this event it was never known that rubber could be made into sheets in such a manner as to prevent the surfaces, when brought in contact, from adhering together, and the whole becoming a solid mass. He obtained letters patent on this discovery, but in a few weeks he was greatly disappointed to find that when the goods were washed with weak acid they became as adhesive as ever, the lime having had merely a superficial temporary effect.

The Acid Gas Process

Shortly thereafter, in 1836, he made the really substantial discovery of what has since been known as the acid gas process. In attempting to ornament a sheet of rubber made by boiling in lime with metal bronze, and not producing the desired effect, he afterwards applied nitric acid to remove the bronze, but this discolored the sheet and he discarded it. It later occurred to him that the discoloration was remarkable, and by using nitric acid he succeeded in the course of a few months in making fully satisfactory specimens of non-adhesive rubber sheets. This process, while adaptable for making thin sheets, did not however change the character of thick sheets of the gum throughout. Patent was received on this invention in 1837. The discovery received unusually wide notice, and the inventor received several medals in recognition of this contribution to the art of rubber manufacture.

Several establishments were still making cloth-and-rubber shoes in America. In 1836 the factory at Troy, N. Y., which had burned down, was rebuilt, and made nearly 100 pairs daily. Shoes, aprons, life preservers, and belting were also made by the Salem India Rubber Co., Salem, Mass. The Roxbury company was still intermittently active, and Hayward continued at the Eagle Rubber Co., at Woburn. In 1837 Stephen C. Smith, of New York, brought forward a process for making boots and shoes coated with sheet rubber, and obtained patent. But the first all-rubber overshoe properly so-called was made in the winter of 1837-1838 by Goodyear, assisted by his daughter, in a cellar in New York, apparently using the acid gas process, and he obtained a patent for making shoes wholly of india rubber.

Under this patent the so-called "Goodyear patent shoe" was made in large numbers at Providence, R. I., and a few other places, and from this time on shared the market with the "old-fashioned rubber" imported from Brazil, although the latter was superseding the former rapidly just before vulcanization was subsequently introduced by domestic manufacturers. The Providence company was known as the firm of Isaac Hartshorn & Co., the business being owned by Messrs. J. W. Clark, of Boston, and Charles Jackson, of Providence, who purchased the shoe patent and license to manufacture under the acid gas process from Goodyear. Probably much of the rubber imported in 1837-1842 was used by this company.

(*Another article will appear in a subsequent issue.*)

Swelling and Solvation of Rubber in Different Solvents[1]

Ira Williams[2]

TWO principal explanations for the high viscosity of rubber sols have been advanced. Staudinger and coworkers[3] believe that rubber consists of extremely long, stiff, and extended molecules which, even in low concentration, interfere with one another during flow because of the large space required for the rotation of a single molecule. They recognize that a fiber molecule can be solvated,[4] but do not believe that the viscosity depends primarily on solvation.[5] This explanation for the high viscosity of rubber solutions has been widely accepted since its introduction. Other investigators[6] believe that rubber is micellar and probably solvated when dispersed in solvents. The solvated unit is usually considered to consist of a number of molecules more or less loosely bound into a group which becomes greatly swollen and in this manner removes a great portion of the liquid as an effective dispersing medium. According to Meyer and Mark, one gram of rubber in 100 cc. of benzene would imbibe solvent to produce a system containing 20 to 40 grams of solvated rubber in 80 to 60 cc. of free benzene. Hatschek believes the swollen units to be more or less mobile and easily deformed so that flow takes place in high concentration only by distortion of the solvated unit.

A close relation between the viscosity of rubber sols in various types of solvent and the swelling of rubber produced by the same solvents would indicate a micellar structure for rubber sols. The process of imbibition which involves forces small enough so that slight changes in the system (such as cooling) will often produce syneresis, could be expected to immobilize a considerable amount of liquid. The effect of this immobilization on viscosity would be that caused by both a decrease in the volume of solvent and an increase in the effective volume of dispersed material. Although a single molecule would not be expected to swell, it might immobilize a certain quantity of solvent by association. The viscosity of a molecular solution of low concentration of most materials is, however, usually little greater than the viscosity of the solvent.

Different solvents have been shown by Van Rossem,[7] Kawamura and Tanaka,[8] Sakurada and Tanaka,[9] and Philippoff[10] to produce sols of different viscosity. Kirchhof[11] noticed the difference in solvent power of benzene, gasoline, carbon tetrachloride, and various chlorinated acetylenes and also pointed out the parallel between swelling and solvent action. Hatschek noted from the data of Kirchhof that a relation existed between swelling power and relative viscosity. Kitsuta[12] presented data which showed a large variation in the relative viscosity of rubber sols produced with carbon disulphide, benzene, chloroform, carbon tetrachloride, and trichloro- and tetrachloroethane. The difference in viscosity of rubber sols in the common solvents such as benzene and gasoline is small.

Variation in Viscosity

The fractional increase in viscosity produced by rubber in a number of solvents has been found to vary within wide limits.

The time of flow is shown in Table I to differ considerably for each solvent and solution. The variation in viscosity of sols of low concentration is almost in proportion to the variation between the solvents. The same general tendency is shown at the highest concentration, but chlorobenzene and dibutylamine fall somewhat out of line.

TABLE I. TIME OF FLOW OF RUBBER SOLUTIONS AT 30° C.

	Grams Rubber per 100 Cc. Soln.: Time of Flow, Seconds								
Solvent	0	0.095	0.125	0.25	0.375	0.5	0.75	1.0	2.0
Chlorobenzene ..	71.1	81.7	85.8	102.6	129.6	156.8	235.0	321.7	944.0
Benzene	70.6	81.7	84.7	103.8	128.9	153.7	224.5	294.5	876.0
Gasoline	79.1	88.2	93.4	106.0	134.6	157.5	230.4	303.5	891.0
Dibutylamine ...	104.3	117.2	120.5	138.6	161.2	187.5	247.2	315.2	762.0
Amyl chloride ..	63.3	67.4	69.0	76.4	89.7	95.6	135.2	172.7	490.0
Caproic acid ...	292.0	307.5	326.5	349.1	393.1	430.0	535.5	651.0	1334.0
Ether	44.4	47.1	48.1	52.3	57.9	62.5	76.8	96.0	231.7
Benzotrifluoride .	53.7	56.7	57.4	61.7	66.8	73.5	87.6	106.7	247.8
1 vol. benzene plus: 2 vol. nitrobenzene	102.1	106.7	108.0	112.0	125.6	130.9	165.2	200.5	443.7
4 vol. menthol .	513.6	...	...	695.0	...	...	1257.0	...	3917.0

The fractional increase in viscosity $[(T \text{ solution} / T \text{ solvent}) - 1]$, which at any fixed low concentration should, according to the formula of Staudinger,[13] be proportional to the molecular weight or chain length of the rubber molecule is shown in Table II and Figure 1. These data show that the fractional increase in viscosity decreases continually with decreasing concentration and at no low concentrations do the values approach constancy. The value obviously becomes zero at zero concentration. These data agree with the findings of Zhukov, Komarov, and Gribova[14] for sodium butadiene rubber, sodium iso-

[1] Presented before the Division of Rubber Chemistry at the ninety-second meeting of the American Chemical Society, Pittsburgh, Pa., September 7 to 11, 1936. Contribution 33 from the Jackson Laboratory, E. I. du Pont de Nemours & Co., Inc. Abstracted from *Ind. Eng. Chem.*, Feb., 1937, pp. 172-74.

[2] E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

[3] H. Staudinger, "Die hochmolekularen organischen Verbindungen," p. 79. Berlin, Julius Springer, 1932.

[4] *Ibid.*, p. 126. Staudinger and Moyen, *Kautschuk*, 12, 159 (1936).

[5] Staudinger and Nodzu, *Helv. Chim. Acta*, 13, 1350-54 (1930); *Rubber Chem. Tech.*, 4, 545 (1931).

[6] P. Bary, *Compt. rend.*, 170, 1388 (1920). E. Hatschek, *J. Phys. Chem.*, 31, 386-90 (1927). J. Kawamura and T. Kumkiti, *J. Soc. Chem. Ind. (Japan)*, Suppl. binding, 35, 186-91 (1932); *Rubber Chem. Tech.* 5, 627 (1932). Meyer and Mark, *Ber.*, 61, 1946 (1928). R. Pummerer, *Ber.*, 60, 2167 (1926). P. Stamberger, *Kolloid-Z.*, 45, 239-44 (1928).

[7] Van Rossem, *Kolloidchem. Beihefte*, 10, 108 (1918).

[8] Kawamura and Tanaka, *J. Soc. Chem. Ind. (Japan)*, 35, 1866 (1932).

[9] Sakurada and Tanaka, *J. Soc. Chem. Ind. (Japan)*, 37, 470 (1934).

[10] W. Philippoff, *Kautschuk*, 12, 124 (1936).

[11] F. Kirchhof, *Kolloidchem. Beihefte*, 6, 1-22 (1914); Kolloid-Z., 15, 30 (1914).

[12] K. Kitsuta, *J. Rubber Soc. (Japan)*, 3, 220-2, 224-9 (1931); *Rubber Chem. Tech.*, 5, 620 (1932).

[13] H. Staudinger, *Z. angew. Chem.*, 45, 276-92 (1932).

[14] Zhukov, Komarov, and Gribova, *Sintet. Kauchuk*, 5, 9-12 (1936).

prene rubber, and chloroprene polymer. The fractional increase in viscosity at any fixed concentration varies with the nature of the solvent. This is in contrast to the statement of Staudinger[15] that the solvent is without significant influence. Such results show that the effective size of the dispersed rubber particle, whether molecular or micellar, is not constant in all dilute solutions, but is different in each solvent. If the fractional increase in viscosity is caused directly by unsolvated molecules, then certain solvents must bring about a decrease in molecular size of the rubber. This appears unlikely when chemically inactive solvents are used.

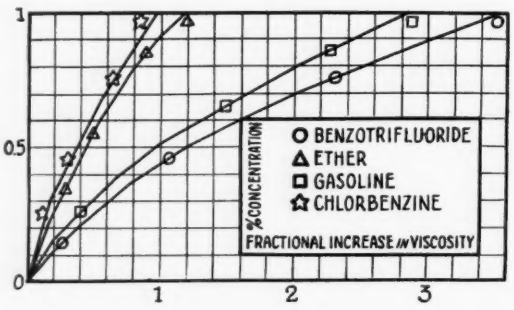

Fig. 1. Fractional Increases in Viscosity of Rubber Solutions

In Table II the fractional increase in viscosity bears no relation to the viscosity of the solvent. If the increase in viscosity is due only to the length of a rigid filiform molecule, the percentage increase should either be uniform in all solvents or vary as some function of the viscosity of the solvent. Since no relation is obvious between the increase in viscosity and the viscosity of the solvent, it must be concluded that the viscosity is controlled by some factor other than the size and shape of the rubber molecule.

TABLE II. FRACTIONAL INCREASE IN VISCOSITY OF RUBBER SOLUTIONS

Solvent	Viscosity of Solvent Sec.	Grams Rubber per 100 Cc. Soln.: 0.095	0.125	0.25	0.375	0.5	0.75	1.0	2.0
		Fractional Increase in Viscosity							
Chlorobenzene	71.1	0.15	0.21	0.44	0.82	1.20	2.30	3.52	12.27
Benzene	70.6	0.16	0.20	0.47	0.82	1.18	2.17	3.17	11.41
Gasoline	79.1	0.12	0.18	0.34	0.70	0.99	.192	2.84	10.25
Dibutylamine	104.3	0.12	0.15	0.33	0.54	0.80	1.37	2.02	6.29
Amyl chloride	63.3	0.06	0.09	0.20	0.42	0.51	1.12	1.72	6.74
Caproic acid.....	292.0	0.05	0.12	0.20	0.35	0.47	0.83	1.23	3.60
Ether	44.4	0.06	0.08	0.18	0.30	0.41	0.73	1.16	4.21
Benzotrifluoride ...	53.7	0.05	0.07	0.15	0.25	0.37	0.63	0.98	3.61
1 vol. benzene plus:									
2 vol. nitrobenzene	102.1	0.044	0.06	0.10	0.23	0.28	0.62	0.96	3.34
4 vol. menthol ...	513.6	...	...	0.35	...	...	1.45	...	6.62

The fractional increase in viscosity according to the formula of Staudinger is directly proportional to the molecular weight when a fixed low concentration is considered. When applied to this formula, the data in Table II indicate that the molecular weight of the same rubber varies as much as 300% under the influence of different solvents.

Rubber is not degraded after being dissolved in a solvent which produces a low viscosity. After removing the solvent it is possible to replace it with another and thus obtain a viscosity characteristic of the second solvent. This process can be repeated a number of times if the rubber is protected from oxidation.

Table III indicates that rubber is not changed in any manner by being brought into solution, but reaches a definite equilibrium with each solvent.

TABLE III. VISCOSITY CHANGES CAUSED BY REPLACING ONE SOLVENT WITH ANOTHER

Order	Solvents	Viscosity Sec.	Solvents	Viscosity Sec.
Original	Ether	212	Benzotrifluoride	245
2	Benzene	715	Chlorobenzene	836
3	Ether	231	Benzotrifluoride	222
4	Benzene	730	Chlorobenzene	798

Variation in Swelling

Swelling tests were made on both vulcanized and unvulcanized rubber.

The results of these measurements are shown in Table IV compared with the viscosity data for the 2% solution from Tables I and II. The data agree in general with the observation of Kirchhof[11] and Hatschek[6] that the best swelling agent produces a solution of the greatest viscosity. Although the actual viscosity depends on the viscosity of the solvent, the fractional increase in viscosity shows a close parallel with the swelling power of the same solvent for either vulcanized or unvulcanized rubber. Dibutylamine has an abnormal swelling action on vulcanized rubber in accord with the known effect of accelerators on rubber containing combined sulphur.[16]

TABLE IV. SWELLING POWER AND VISCOSITY

Solvent	2% Solution: Viscosity, Seconds	2% Solution: Fractional Increase in Viscosity	Vol. of 1 Cc. at Max. Swelling, Cc.: Evaporated Latex	Sheets	Vulcanized Rubber
Chlorobenzene	944	12.27	37	28	9.8
Benzene	876	11.41	30	13	8.4
Gasoline	891	10.25	33	10	5.4
Dibutylamine	762	6.29	21	9	8.0
Ether	232	4.21	14	4	3.9
Caproic acid	1334	3.60	10	8	4.1
Benzotrifluoride	248	3.61	8	7	3.1

The swelling of rubber depends to a great extent on the state of oxidation of the rubber. The oxidation of rubber during milling reduces the swelling required to detach the final swollen unit of rubber and, by creating more points of cleavage, causes a decrease in the size of the resulting micelle. Rubber which has been milled sufficiently appears to dissolve from the surface with little swelling.

The difference in swelling power of liquids and the relation between swelling and viscosity is not confined to rubber sols. Solutions of chloroprene polymer have been found to act in a similar manner. The fractional increase in viscosity is, however, considerably smaller than that for rubber, being 2.39, 1.74, and 1.18 for a 2% solution of chloroprene polymer in benzene, amyl chloride, and dibutylamine, respectively. The polymer was not soluble in ether or benzotrifluoride.

Conclusions

The large variation of the fractional increase in viscosity of rubber sols and its lack of relation to the viscosity of the solvent indicate that the increase in viscosity is not due to rigid filiform molecules.

The ability to interchange solvents and obtain a viscosity characteristic of the solvent shows the existence of a reversible equilibrium between the solvent and the rubber.

The close relation between the maximum swelling and the fractional increase in viscosity of rubber in different solvents suggests that rubber sols contain swollen micelles of rubber. The extent of swelling and the viscosity depend on the equilibrium between solvent and rubber which, in turn, depends on the state of oxidation (or other suitable chemical attack) of the rubber.

A rubber sol becomes a gel at the concentration which immobilizes essentially all the solvent.

The relative viscosity of rubber sols of equal concentration in the same solvent is probably some function of the degree of solvation of the dispersed particles which is influenced by the degree of oxidation of the rubber. Viscosity is not a measure of the molecular weight.

[15] H. Staudinger, "Die hochmolekularen organischen Verbindungen," pp. 57, 178.
[16] I. Williams, *Ind. Eng. Chem.*, 26, 1191-3 (1934); *Rubber Chem. Tech.*, 8, 102 (1935).

Rubber Mountings for Large Industrial Machines—I[1]

The Demand for Vibration Isolation Has Reached the Field of Heavy Machinery. Three Successful Installations Described Here Show How Such Machines Can Be Designed Originally with Rubber Mounting Systems

Stuart H. Hahn[2]

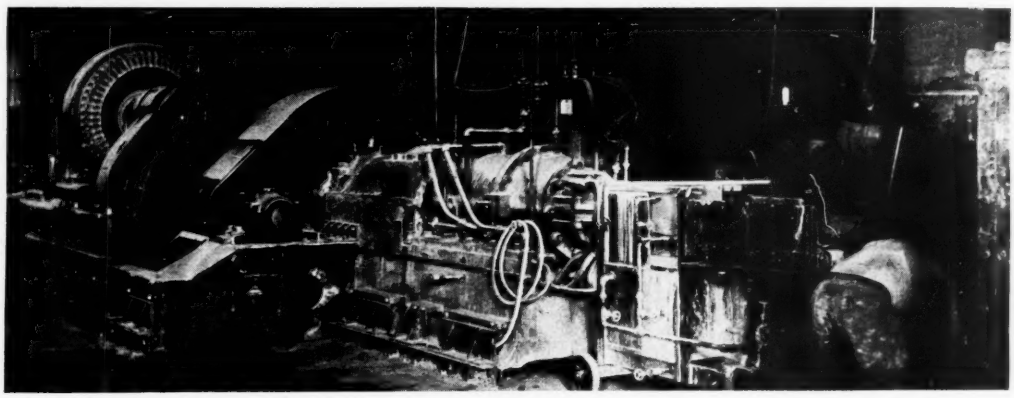

Fig. 1. The 15-Inch Gordon Plasticator Weighing Nearly 30 Tons with Its 250 H.P. Synchronous Motor and Reduction Gear All on One Base Mounted on Flat Type Rubber Mountings

THE problem of noise and vibration has become so acute in modern life that relief is being demanded by the public for its own comfort and well being[3] and by the technical world because of the destructive effects of vibrations on buildings and machinery. Vibration is uneconomical.

Reduction of vibration at its source by improved design and construction has been the trend for years, but the increasing demand for greater output and higher speeds has largely nullified the effects of these improvements. Thus has come about the need for cushioning residual vibration and, as in the automotive industry, we find rubber mountings used to an increasing degree on many types of light machinery. Although the use of compression-type rubber mountings under fairly heavy power generating equipment has been discussed in Germany,[4] it is believed that no applications of rubber mountings of any type to heavy industrial machinery have been reported in this country.

Shear-type rubber mountings have been effectively isolating the vibrations of five large machines in the main plant of The B. F. Goodrich Co. for periods of from one to more than three years. The total weight of these units is about 430,000 pounds. All are installed on the fourth or higher floors of buildings of various types used for manufacturing, office, or machine-shop purposes. Experience with these installations has been uniformly favorable. The degree of cushioning obtained, and the durability and stability of the mountings have been entirely satisfactory. At the present time four more machines totaling in weight about 200,000 pounds are being installed on rubber mountings. The application of rubber mountings to large industrial machines has emerged from the experimental stage.

Mounting for a 15-Inch Gordon Plasticator

The oldest of the installations mentioned employs flat plate, single shear-type mountings to support a 15-inch Gordon plasticator, a product of Farrel-Birmingham Co., as shown in Figure 1. This machine with its 250 h.p. synchronous motor and reduction gear weighs nearly 30 tons. Resembling other screw-type extrusion machines, it is used to soften or "plasticate" crude rubber which is fed into its hopper in 37-pound pieces and leaves the die of the machine in the form of a continuous sheet of plasticized rubber.

Rubber mountings and a welded steel sub-base were designed to fit a unit originally intended to be grouted and bolted to its foundation. Favorable elements included the adaptability of the machine to a unit assembly and ample head room allowance. The heavy torques and internal stresses involved and the lack of a rigid, unitary sub-base were unfavorable to the design. A welded base was made principally of 20-inch I-beam members. It was bolted in a massive joint to the rear of the Meehanite bed casting of the plasticator. The low speed pinion shaft

[1] Reprinted from *Product Engineering*, Feb., 1937, pp. 59-62.
[2] Physical Research Laboratory, The B. F. Goodrich Co., Akron, O.
[3] Series of papers by S. A. Moss, Johns-Hopkins University, in *S.A.E. Journal*, starting September, 1929.
[4] "Gummifundamente." K. Oeser, *Kautschuk*, pp. 121-26, Aug., 1934.

Fig. 2. Large Sandwich or Flat Plate Mountings with a Load Capacity of 4,600 Pounds, Used on the 15-Inch Gordon Plasticator

mountings have a static deflection of about 2⅜ inches. This could not have been obtained economically in the flat or sandwich-type of mounting. It was therefore decided to design the mountings so that they would give the machine a resonant frequency sufficiently low to isolate the lowest disturbing frequency from the gears (about 90 cycles per second from the bull gear and its pinion), yet high enough to avoid more than very slight amplification of any disturbance resulting from motor unbalance. Dynamic unbalance of the motor was corrected satisfactorily by an experienced mechanic without dismantling the machine.

Rubber mountings of the sandwich type were designed to give the machine a fundamental resonant frequency of about 16 cycles per second in the vertical translatory mode of vibration. Each has a load capacity of about 4,600 pounds (unit shearing stress 20 pounds per square inch) and has at that load a spring constant of about 90,000 pounds per inch. One of these mountings is shown in Figure 2. The main members consist of one-half inch steel plates to which the rubber is vulcanized. Adhesion between rubber and metal was secured by brass-plating the metal parts and vulcanizing each unit under pressure in a mold. These mountings will carry continuous loads well in excess of 200% of the rated load.

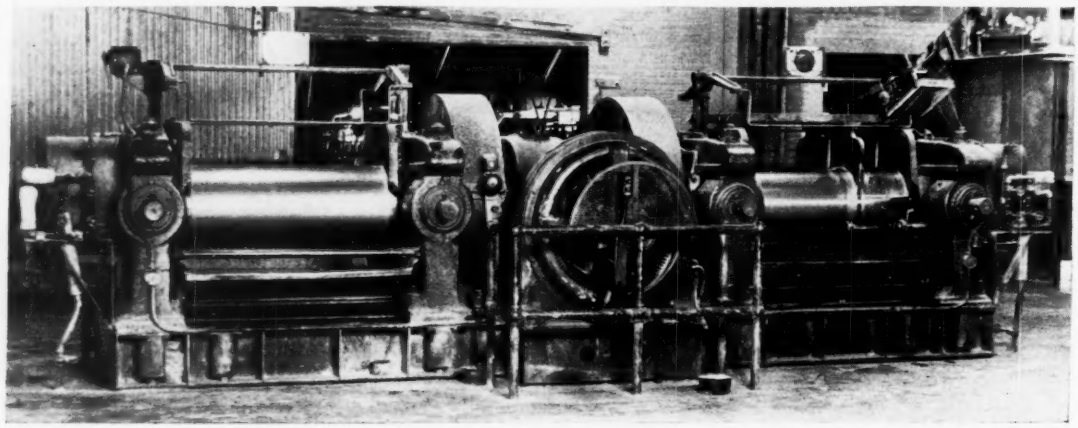

Fig. 3. Double Unit 60-Inch Rubber Warming Mill. The Cylindrical Pieces in the Sub-base Are Split Shell Tubular Rubber Mountings

driving the plasticator bull gear carries peak loads exceeding 250 h.p. at 90 r.p.m. Provision of a rigid support for the heavily loaded main drive pinion was aided by the adoption of a short continuous shaft with three bearing supports for the main pinion and the gear of the speed reduction unit in place of the original longer and coupled two-piece shaft with four bearings.

The use of existing equipment dictated the relatively low motor speed of 514.3 r.p.m. Possible dynamic unbalance of the motor and the attached parts would produce the lowest frequency of any vibrating force likely to cause trouble. In order to isolate this lowest disturbing frequency satisfactorily, the ideal mounting design would, therefore, have required a sufficient rubber thickness to reduce the natural or resonant frequencies of the machine to about two cycles per second.[5] Considering only vibration in the vertical plane, isolation of unbalanced vibration from the motor would have required that the rubber

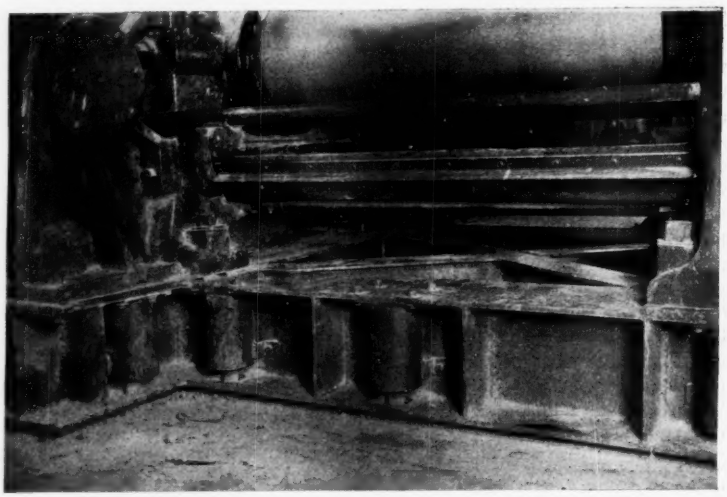

Fig. 4. Close-up of Sub-base of the Mill Showing How the Tubular Rubber Mountings Were Applied

[5] S. Timoshenko, "Vibration Problems in Engineering," (Van Nostrand) or any standard text on vibration problems.

Warm-up Mills

A typical 60-inch rubber mounted double mill unit is shown in Figure 3. The oldest of these units has been in continuous service for nearly three years. As shown in the sub-base in Figure 4, these units are supported by tubular rubber shear mountings, Figure 5, which are bolted to the outer side of the upper flange of the wide flange beam used in the sub-base.[6] This is the first application of large tubular mountings to industrial machinery of which we have knowledge.

The design of the mill-unit sub-base was relatively less difficult than that of the Gordon plasticator because of the lower torques and gear tooth loads involved. Its compact and symmetrical arrangement also aided in simplifying the design. The peak power loads delivered by the main pinions rotating at about 120 r.p.m. are of the order of 80 horsepower.

The design of the mill mountings are dictated by the low value of the minimum disturbing frequency, that of the tooth impacts which may be set up by the roll neck connecting gears. This frequency was raised to a reasonable value of about 10 cycles per second by the use of staggered tooth gears. The fundamental frequencies of the various critical modes of vibration of these mill units are all three to four cycles per second. The static deflection of the mountings when carrying the load of the complete assembly is about one inch. In mountings of the dimensions used this value may be varied over a range of about plus or minus 30% by the use of different rubber compounds.

These tubular mountings are made up by vulcanizing rubber of suitable grade to a central seamless steel tube and to semi-cylindrical outer metal shells separated by suitable gaps. The unit is molded to an outside diameter somewhat greater than the inside diameter of the housing tube so that the rubber is compressed when the unit is pressed into its housing. The degree of compression is so chosen that shrinkage stresses set up in the rubber during vulcanization are relieved. This factor, together with the use of tapered ends, permits the use of much higher maximum unit shearing stresses between rubber and metal than would be permissible without this construction. These units have a load capacity of 4,000 to 5,300 pounds each and a spring constant of from 3,800 to 7,000 pounds per inch of deflection, depending on the type of rubber compound.

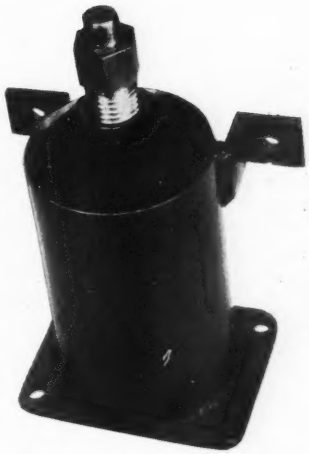

Fig. 5. Split Shell Tubular Mounting, Having a Load Capacity of 4,000 to 5,300 Pounds and a Spring Constant of from 3,800 to 7,000 Pounds per Inch, Used on the 60-Inch Warming Mill

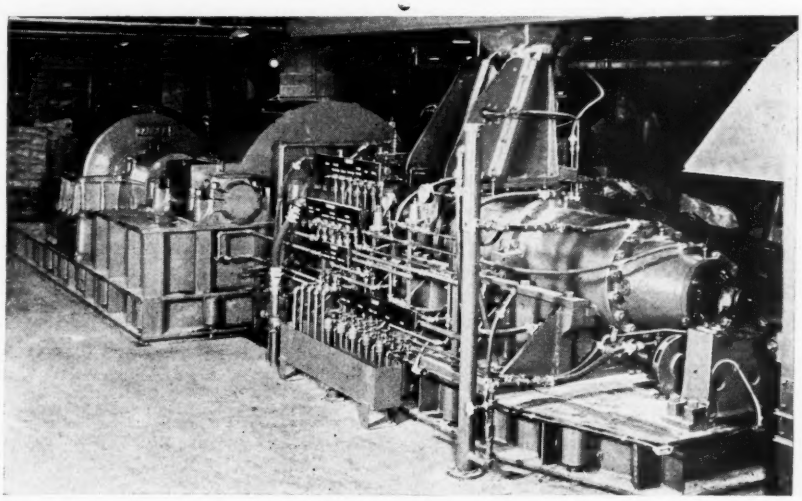

Fig. 6. Showing the Welded Steel Sub-base and Rubber Mounting Arrangement on the 20-Inch Gordon Plasticator. A Total of 31 Tubular Shear Mountings Are Used

20-Inch Gordon Plasticator

Convinced that the experimental state in the use of rubber mountings for heavy machinery had been passed, the Goodrich engineering staff undertook the design of a sub-base and rubber mounting arrangement for a new Gordon plasticator, shown in Figure 6, the largest machine of its kind. The design presented a numer of serious problems, among them the following:

1. The large torque involved in delivering peaks of about 700 h.p. at 123 r.p.m. to the plasticator pinion necessitated the use of a unitary assembly. The torque delivered by the low speed shaft would be almost sufficient to overturn the reduction gear and motor section of the machine if it were mounted separately from the plasticator proper. This comparatively large transfer of load on the mountings would have created such irregular loading that trouble with variable creep in the rubber and consequent coupling misalinement would have been difficult to avoid. Possible instability in the transverse rocking mode of vibration would also have required careful study.

2. The necessity for maintaining rigid support for the shaft carrying the wide (24-inch) main drive herringbone pinion called for an unusually rigid sub-base construction which would have been

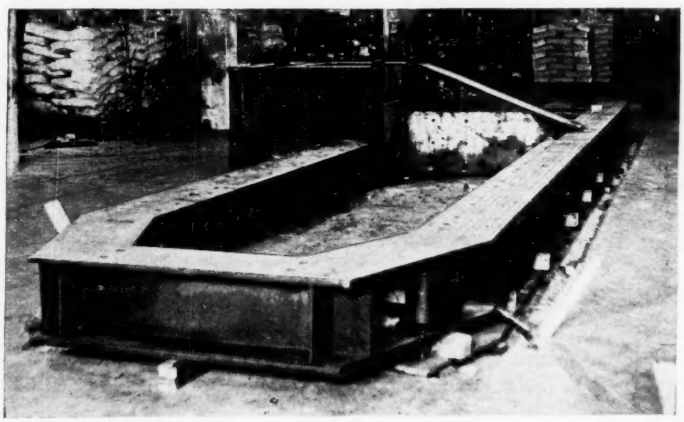

Fig. 7. Welded Steel Sub-base, 42 Feet Long and 11 Feet Wide and Weighing about 22,000 Pounds, Designed to Carry the Complete Assembly of the 20-Inch Gordon Plasticator

[6] U. S. patent No. 1,958,141 (F. L. Haushalter to B. F. Goodrich Co., May 8, 1934).

difficult to secure in a multiple unit design. This gear is subject to tooth loads on the order of 1,500 pounds per inch of width at a pitch line speed of about 720 feet per minute. The pinion shaft bearings produce concentrated loads on the sub-base of about 20,000 pounds each.

3. A large eccentric bending load on the bed casting produced by the forward thrust of the rubber passing through the cylinder of the machine, held in place on longitudinal ways by an adjusting screw about 18 inches below the centerline of the rotor, together with the reaction on the rotor thrust bearing, causes an estimated bending moment of about 500,000 inch pounds. The large radial roller bearings and Kingsbury thrust bearing require particularly rigid support.

4. Head room restrictions would not permit raising the machine more than six inches above the floor.

The welded steel sub-base, shown in Figure 7, is 42 feet long and 11 feet wide, and weighs about 22,000 pounds. It was designed to carry the complete assembly as a unit. The original design of the plasticator bed casting was modified by the manufacturers to increase its stiffness and adapt it to mounting on the steel sub-base. To the base were attached 31 tubular shear mountings of the type used so successfully in mounting several double mill units like the one which has been described. These mountings were so located as to obtain uniform mounting loads together with minimum bending moments in the sub-base. The ruling factor in the choice of mounting design was the frequency of the slowest rotating part likely to be a source of vibration. This frequency, 12 cycles per second originating in the 720 r.p.m. synchronous motor and connected parts, is effectively isolated by mountings having a natural frequency of vertical oscillation under rated load of slightly more than three cycles per second.

Notwithstanding the relatively wide variation in concentration of loads in various parts of the sub-base mountings of uniform size and construction were used successfully to support and cushion the load uniformly. Distribution of the mountings was based on careful estimates of the weight distribution in the various parts of the machine, which were checked, wherever possible, by actual weighing. An estimate of the polar moment of inertia of the machine was made for the purpose of calculating the probable resonance frequency of the transverse rocking mode of vibration. This frequency was found to be safely below that of the possible transverse disturbance which might be set up by unbalance in the motor, the shaft of which was located at a considerable distance above the level of the mountings.

In general, any body mounted on a system of elastic supports which are not in themselves constrained to any definite "deflection path" will have six degrees of freedom. Three of these are the components of its translatory or "straight-line" motions which are usually referred to three mutually perpendicular axes, one of which is vertical. The other three are the rotational components of motion likewise usually referred to three mutually perpendicular axes. Considering the more usual types of industrial machines, it is often true that only one of these six degrees of freedom—that of vertical translation—has much importance. Vertical oscillatory forces are the more usual sources of annoying vibration.

However, it may sometimes be necessary to make an analysis of the dynamics of a spring-mounted machine in several of its degrees of freedom, especially if there are rotating unbalanced forces, or reciprocating forces in horizontal planes. Such forces may frequently be found to act transversely to the longitudinal axis of the machine so that transverse translatory or rocking motions will be set up either alone or in combination. Hence the natural frequency of the machine in one or both of these (and possibly in other) modes of vibration must be studied. To calculate the natural frequency of rocking, the flywheel effect or polar moment of inertia of the machine and the angular spring constant or torque per unit of angular deflection set up by the springs at their known locations must be determined. Such angular spring constants will usually depend on a combination of the vertical and horizontal deflection characteristics of the individual spring units. In general, the horizontal characteristic of any spring intended primarily for resisting vertically applied force will also depend partly on the elastic characteristics of its attachment to the foundation.

The success of these rubber mounting installations is proved by the fact that almost all new machinery installations in the upper floors of buildings of the Akron plants of the Goodrich company which have been made in the past four years have been equipped with rubber mountings. When present work is completed eleven units with a gross weight of about 675,000 pounds will be in service. The reduction in building vibration secured through the use of the mountings has been marked in every installation. In a few cases records of vibration with and without rubber mountings have been secured with vibrographs. Some of these records will be shown in Part II of this article.

Colored Powdered Rubber[1]

A COLORED, powdered rubber may be prepared in accordance with the following procedure. About 60 pounds of a 10% casein solution is added, with stirring, to about 250 pounds of ammonia-preserved latex of 40% solids content. An aqueous suspension of coloring matter, the particles of which are of colloidal fineness, is then added in desired amount to the latex-casein mixture. The resulting colored mixture may, if desired, be diluted with water to a solids content of about 20%. The mixture is then treated while being stirred with a solution prepared by dissolving five pounds of zinc chloride and about one ounce of acetic acid in about 200 to 500 pounds of water. The mixture thus treated may have a pH value of approximately eight. It gradually thickens, and its solids content is finally resolved into a slurry of rubber flocs. The slurry of dyed rubber flocs is then dewatered, as in a filter press, producing a cake of about 60% to 70% solids content which will crumble readily. It is preferably dusted with talc, zinc stearate, or other suitable dust and passed through a rotary cutter, that reduces it to a powder of about 50 or finer mesh, after which it is dried.

The colored powdered rubber can be readily worked in the desired amount into a rubber batch as it is being milled, the dyed rubber particles tending to disperse uniformly throughout the batch and to color it substantially uniformly. Not only does this practice make possible increased capacity in a rubber mill and a saving of power, but it enables the realization of maximum coloring effect in the resulting rubber compound through the use of a given amount of coloring agent.

These principles apply to the compounding with rubber of other than coloring agents, for instance, vulcanizing agents, accelerators of vulcanization, antioxidants, etc., all of which have heretofore presented to a greater or less degree the same compounding difficulties as have been experienced with coloring agents.

[1] U. S. Patent No. 2,053,530, Sept. 8, 1936.

Examination of Rubber Latex and Latex Compounds[1]

Chemical Testing Methods

D. E. Fowler[2]

LATEX compounds are purchased either on the basis of total solids content or the so-called dry rubber content. The total solids probably furnish a more reliable basis of evaluation, as the determination can be made with a high degree of accuracy. The dry rubber content is not a precise determination, as the proteins, fatty acids, and other non-rubber constituents are included, and in the case of compounded latices some of the compounding materials are included in the value and some are not. Hauser,[3] and Noble[4] include in their books useful chapters on testing latex.

Total Solids

The total solids are determined by weighing about two grams of the sample in a low covered weighing dish about 6.25 cm. (2.5 inches) in diameter on an analytical balance. A metal weighing dish is preferred for more rapid drying. Tinned 60-ml. two-ounce) ointment cans are satisfactory and so inexpensive that they may be thrown away if they are at all difficult to clean. The sample is dried, preferably in a vacuum oven. The temperature may be increased to 120° C. in a vacuum without any apparent oxidation or deterioration of the rubber. A sample of normal latex may be completely dried in about ten minutes if the drying arrangement is right. Results are accurate to better than 0.1%.

Methods involving the use of specific gravity are worse than useless when applied to preserved latex as a concentration control. Even in the case of unpreserved, unwatered normal latex on the plantations, the hydrometers must be calibrated especially for the latex from the estate on which they are to be used.

Dry Rubber Content

A number of official methods for determining the dry rubber content have been described. Usually the diluted latex is coagulated with acetic acid and the coagulum dried. The various official methods usually differ only in minor details. The method as prescribed by the Customs of the Commonwealth of Australia[5] for evaluating latex for tariff purposes is as follows:

Place a weighed quantity of latex (approximately 10 grams) in a porcelain or glass basin of about 200-ml. capacity. Add gradually, with constant stirring, a 1% solution of acetic acid until the latex appears to be completely coagulated and the addition of more acid produces no apparent effect. Manipulate coagulum with stirrer until all particles are collected in one mass.

Place basin on a steam bath for 30 minutes; pour off and wash coagulum with water.

Remove coagulum from basin and pass it several times through rollers to squeeze out serum. Wash the thin rubber with water and finally dry it at 100° C. until the rubber no longer loses weight. The percentage of dry rubber so found shall be the crude rubber content of the latex tested.

The relation between the acetic acid rubber (dry rubber content) and solids for unwatered normal latex is roughly: Acetic acid rubber + 2.3 = total solids.

Determination of Ammonia

If ammonia alone has been added to latex, it is usually satisfactory to titrate directly with standard acid, using methyl red as indicator.

Weigh about ten grams to the nearest centigram in a 400-cc. rubber-extraction flask. Add about 200 cc. of water, a few drops of methyl red indicator, and titrate with 0.588 *N* acid, being careful to keep the solution well agitated throughout the determination. The volume of acid used divided by the weight of sample will give the percentage of ammonia. If only occasional tests are required, 0.5 *N* or 0.1 *N* acid may be used. The presence of hexamethylenetetramine does not interfere to any appreciable extent.

If other alkaline materials, such as sodium or potassium hydroxide, borax, or sodium silicate, are present in addition to the ammonia, the ammonia may be distilled over into standard acid and titrated.

Weigh about five grams of the sample from a weighing pipet into an 800-cc. Kjeldahl flask containing about 250 cc. of distilled water. Distilled over about 200 cc. into an excess of 0.1 *N* sulphuric acid. Back-titrate the excess of standard acid with 0.1 *N* sodium hydroxide using methyl red as indicator.

$$\frac{(\text{cc. of acid} \times \text{normality factor} - \text{cc. of base} \times \text{normality factor}) \times 1.7}{\text{weight of sample}} = \% \text{ NH}_3$$

In compounds which contain no fixed alkali, the distillation method will give only the free ammonia. Ammonium

[1] Presented before the Division of Rubber Chemistry at the ninety-second meeting of the American Chemical Society, Pittsburgh, Pa., September 7 to 11, 1936. Reprinted from *Ind. Eng. Chem. (Anal. Ed.)*, Feb. 15, 1937, pp. 63-66.

[2] Naugatuck Chemical, Division of United States Rubber Products, Inc., Naugatuck, Conn.

[3] Hauser, "Latex," Chap. 4, N. Y. Chemical Catalog Co., 1930.

[4] Noble, "Latex in Industry," Chap. 10, New York, *The Rubber Age*, 1936.

[5] Australia Customs Tariff Proposals, Tariff Item No. 331D (Nov. 28, 1935).

soaps are also included if a little sodium hydroxide is added before the distillation. One cubic centimeter of normal caustic will take care of all the ammonium soaps normally present in latex.

In the presence of the alkaline materials mentioned above, total ammonia may be determind by coagulating the latex and nesslerizing the clear serum. The method in detail is as follows:

NESSLER REAGENT. Dissolve 25 grams of potassium iodide in 20 cc. of distilled water. Add saturated mercuric chloride solution until a slight precipitate appears. Add 200 cc. of clear 36% sodium hydroxide solution. Dilute to 500 cc., let stand one day or longer, filter through asbestos in a Gooch crucible, and place in a dark bottle. After about 24 hours the small amount of precipitate will have settled and the solution will be clear.

STANDARD AMMONIA SOLUTION. Dissolve 0.4176 gram of ammonium oxalate, $(NH_4)_2C_2O_4H_2O$, in distilled water and make up to 1,000 cc. Pipet out 20-cc. aliquot and make up to 1,000 cc. This solution contains 2 mg. of NH_3 per liter.

METHOD. Weigh about 10 grams of the latex from a weighing pipet into a 1,000-cc. volumetric flask containing about 950 cc. of water. Shake and add a dilute solution of acetic acid, a few drops at a time, shaking thoroughly between additions until the latex is coagulated. Make the volume up to the mark, mix thoroughly, and filter a portion of the serum, rejecting the first 10 to 20 cc. which do not always come through clear.

In some cases, especially with latex compounds containing pigments, antioxidants, etc., it is necessary to refilter the solution with the aid of a little Celite in order to remove opalescence. The final solution should be perfectly clear and colorless.

Measure an aliquot of this clear filtrate into a 500-cc. volumetric flask and make up to the mark with distilled water. The size of the aliquot depends on the ammonia content of the sample. A 100-cc. aliquot is used when the ammonia content is expected to be about 0.1% and proportionally smaller amounts for higher percentages.

After the aliquot has been made up to 500 cc., measure 25 cc. of this diluted solution in a graduated cylinder, and treat with 1 cc. of Nessler reagent added from a pipet. Compare the color in a colorimeter with that obtained from 25 cc. of the dilute standard ammonium oxalate solution obtained in the same way. Either the distillation or nesslerization method may be applied to black or colored compounds. The color is all carried down with the rubber on coagulation.

FIXED ALKALI. The amount of fixed alkali present may be estimated from the difference between the total alkalinity by direct titration and the ammonia as determined either by distillation or nesslerization.

Hexamethylenetetramine

Hexamethylenetetramine is frequently present in latex compounds. Its presence is of very little importance in most cases, as it is water-soluble and is usually removed from the finished product in the serum or by washing. It may be detected, however, by diluting the latex considerably, adding acid to coagulate and about 25 cc. of normal acid in excess, distilling off some of the water, and testing the distillate with fuchsin sulphite solution. A red or purple coloration indicates hexamethylenetetramine.

The fuchsin sulphite reagent is prepared by dissolving one-half gram of fuchsin and nine grams of sodium bisulphite in 500 cc. of distilled water. Ten cubic centimeters of concentrated hydrochloric acid are added, and the solution is kept well stoppered and away from light.

Hexamethylenetetramine may be determined quantitatively as follows:

Dilute the residue from the ammonia determination by distillation to about 250 cc. with water and add 25 cc. of normal acid from a buret. Boil the flask for about five minutes, cool, and add 26 cc. of normal caustic. Distill the ammonia into standard acid and titrate exactly as described in the ammonia by distillation method above. One cubic centimeter of normal acid is equivalent to 0.035-gram of hexamethylenetetramine.

Determination of Water-Solubles

The amount of water-solubles in latex cannot be easily and completely leached from a latex film by merely boiling with water or extracting with water as is done in the case of the acetone extract. Using such methods, the extraction is very likely to be incomplete, and the results will depend on the amount of surface of the sample extracted.

The water-solubles may be removed from the uncoagulated sample by dialyzing through a parchment membrane with distilled water, but the determination is slow, a week or more being required to remove all the extractable materials. A coagulation method which has proved very satisfactory consists of boiling off the ammonia, diluting considerably, then coagulating by adjusting to the isoelectric point of the protective proteins with a known amount of acid, evaporating an aliquot of the serum, weighing, and correcting for the acid added. The method in detail is as follows:

Weigh about five grams of the sample accurately to a centigram in a 400-cc. beaker, add about 200 cc. of water at once, cover with a watch glass, and boil on a hot plate until the volume has been decreased considerably.

Transfer to a 200-cc. volumetric phosphoric acid flask (this type of flask has a wide neck and is easily cleaned), and make up to within about 10 cc. of the mark, add 1 cc. of a 0.1% methyl orange indicator solution, and add *N* sulphuric acid from a buret until the red-orange color, indicating a pH of about 4.3, is obtained, and the rubber is well coagulated. Care must be taken not to add too much acid, as the sample will not coagulate so well at a lower pH. Shake well to complete coagulation and make up to the mark.

Filter and pipet 100 cc. of the clear serum into a weighed evaporating dish. Evaporate to dryness on a steam bath, dry in an air oven at 70° C., cool, and weigh.

Normal latex has water-solubles of about 8.5% and centrifuged or creamed latices have water solubles of about 2.6% of the total solids.

$$E = \left\{ \frac{W\left(200 - \frac{STR}{10{,}000\,D}\right)}{100} (-0.0049A + I) \right\} \frac{10{,}000}{ST}$$

E = % of water extract
W = weight of dry material in 100-cc. aliquot
T = % of total solids
R = percentage of rubber expected in the solids of the sample, for normal latex 92%, for creamed latex 97%, etc.
D = density of rubber (about 0.92)
A = volume of 0.1 N sulphuric acid used
I = weight of indicator used, in grams
S = weight of sample

Acetone Extract

The acetone extract is not of very much value as a control test for consignments of raw latex, but may be of great assistance in examining samples of unknown composition, particularly compounded samples, and is a necessary part of the usual method of determining free or combined sulphur.

The film should be laid down by pouring some of the latex into a shallow glass tray, which is easily prepared from a pane of window glass and some glass rods or tubing. The glass rod is cut to fit around the edge of the plate and is stuck on with paraffin wax. The edges of the plate are then dipped in molten paraffin wax, thus making a ridge of wax supported by the rods all around the glass plate. The film should be thin and dried at room temperature until it is clear. An electric fan blown over the film hastens drying considerably. The film is then sheeted out as thin as possible on a cold roll, but not broken down.

The prepared film is cut in narrow strips and one gram is weighed in an extraction thimble and extracted for 16 hours, according to the method and using the apparatus recommended by the committee on Methods of Analysis of the Rubber Division of the American Chemical Society for rubber goods.[6] Part of the acetone may be removed by boiling on a hot plate or steam bath, but great care must be observed, and the flask must not go dry. It is possible to scorch the extract on a hot plate with as much as 10 cc. of acetone remaining in the flask, and if the sample goes dry on a steam bath, appreciable amounts of free sulphur may be lost. It is best to stand the flasks in a bath of warm water, 40° to 70° C., remove the acetone by gently blowing air into the flask until it is dry, and finally dry in an air oven at 70° C.

The time of extraction of 16 hours is empirical. The greater part of the extract is removed in this time, but some less easily soluble materials will not be entirely removed if the extraction is continued for several days. The thickness of the film also has some bearing on the quantity of extract removed, as has the rate of boiling.

Free Sulphur

Free sulphur is usually determined on the acetone extract of the film. The bromine method[6] is most commonly used and is satisfactory, except that the results generally contain some, if not all of the sulphur of the accelerator and may be rather confusing. The method of Bolotnokov and Gurova,[7] in which the rubber film is heated with a solution of sodium sulphite, the excess of sulphite destroyed with formaldehyde, and the thiosulphate which was formed titrated with iodine, is very convenient, but some accelerators interfere. This method was modified by Oldham, Baker, and Craytor[8] to prevent interference by mercaptobenzothiazole and is satisfactory in most cases, but tetramethylthiuram disulphide will give high results.

The method has been further modified in the author's laboratory to make it possible to run sulphur on the uncoagulated latex.

> Weigh about ten grams of the latex compound into a 400-cc. rubber-extraction flask and add 100 cc. of a 5% sodium sulphite solution. Bring to the boiling point and boil gently for five minutes on a hot plate. Care must be taken to avoid vigorous boiling or the mixture will froth over the neck of the flask. Remove the flask from the hot plate and add 100 cc. of a 0.5% strontium chloride solution and four cc. of glacial acetic acid. Stir until the rubber is coagulated. Remove the lump of rubber, washing it with a jet of water and squeezing it with the fingers to express as much of the liquid as possible.
>
> To the solution add six cc. of 37% formaldehyde, then a few drops of phenolphthalein and sufficient sodium hydroxide to turn the indicator pink. Add normal acid until the pink color completely disappears, but avoid any considerable excess. Let the mixture stand about ten minutes, then filter it, receiving the filtrate in a 1,000-cc. flask. Wash the filter paper twice with a jet of hot water. Acidify the filtrate with 10 cc. of glacial acetic acid, add cracked ice to bring the temperature below 15° C. and the volume to about 600 cc., and titrate with 0.1 *N* iodine, using about five cc. of a 3% starch solution as the indicator.
>
> 1 cc. of 0.1 *N* iodine = 0.003206 grams of sulphur

Sulphur-bearing accelerators, such as mercaptobenzothiazole, xanthates, carbamates, and thiuram monosulphides, do not interfere with the determination, but tetramethylthiuram disulphide is dissolved, and one-fourth of its sulphur is titrated.

The above method gives the true free sulphur of the sample. The sulphur is in a fine state of division and is reacted on by the sodium sulphite almost immediately, and all chance of loss of free sulphur because of vulcanization during the determination is eliminated. When the other methods are used there is always a chance that the rubber has cured up somewhat and part of the sulphur has combined while the film was being dried or extracted.

Total Sulphur

The Parr sulphur bomb method[9] and the nitric acid-bromine method[6] are both satisfactory. The author has, however, found the perchloric acid[10] method more convenient, rapid, and highly dependable. The perchloric acid method may be carried out as follows:

> To a one-gram sample of the latex film in a 250-cc. rubber extraction flask add 20 cc. of a nitric acid solution one to one and warm on an electric hot plate for one or two minutes until brown fumes appear and the reaction has subsided. Then add ten cc. of concentrated nitric acid and continue heating for about 15 minutes, or until the rubber is nearly entirely dissolved. Add ten cc. of a 60% solution of perchloric acid and heat until dense white fumes appear and the solution (in the absence of insoluble inorganic compounds) is clear and colorless. Allow to cool somewhat and slowly add five cc. of concentrated hydrochloric acid, once more heat until white fumes appear, cool, and wash into a 250-cc. beaker. If the solution is not perfectly clear and free from sediment it should be filtered. Dilute with distilled water to about 200 cc., precipitate the sulphur as barium sulphate in the usual manner, and weigh. If the sample contains free carbon, the free carbon need not be completely oxidized and may be filtered off after diluting. If an insoluble inorganic material is found and the presence of barium sulphate is suspected, this should be filtered off, dried, fused with sodium carbonate, and examined for sulphates.

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[6] A. C. S., Rubber Division, Committee on Methods of Analysis, *J. Ind. Eng. Chem.*, 14, 561 (1922).
[7] V. Bolotnokov and V. Gurova, *J. Rubber Ind.* (*U. S. S. R.*), 10, 61-3 (1933); *Rubber Chem. Tech.*, 8, 87, 1935.
[8] E. W. Oldham, L. M. Baker, and M. W. Craytor, *Ind. Eng. Chem.*, (*Anal. Ed.*), 8, 41-2 (1936).
[9] S. W. Parr, *J. Ind. Eng. Chem.*, 11, 230 (1919).
[10] E. Wolesensky, *Ibid.*, 20, 1234 (1928).

Combined Sulphur

The sulphur which is left in the rubber sample after extraction with acetone is usually considered as the combined sulphur. It may be determined directly on the extracted sample by the perchloric acid method described for total sulphur or may be computed as the difference between the total and free sulphur.

Combined sulphur is valued as a measure of the degree of vulcanization of a rubber stock and is frequently considered as a measure of the sulphur which has actually combined with the rubber. In most stocks, however, this is only partly true, for the combined sulphur figure would include sulphur which had been changed into or added as sulphides or other inorganic sulphur compounds. A very careful consideration of the compound and method must be made in interpreting combined sulphur values.

The T-50 test, described in a previous paper,[11] is a reliable measure of state of cure and may be correlated with the true combined sulphur value of any latex compound that can be stretched considerably.

Copper

The determination of copper and manganese in latex and compounding materials should be made occasionally. Traces of both of these elements are troublesome and cause poor aging, but quantities of either element up to 0.0015% will do no harm.

Sodium dimethyldithiocarbamate is a very satisfactory reagent for determining copper. It is very sensitive and if the details listed below are followed, iron and other usually occurring elements do not interfere.

Weigh about ten grams of the dry film into a 150-cc. beaker, and ignite in a muffle at about 400° C. to a white ash. Cool and take up the ash with about one cc. of hydrochloric acid and a drop of concentrated nitric acid. Evaporate to dryness on a water bath and take up with distilled water.

Treat the aqueous solution with two grams of citric acid and a drop of phenolphthalein, and add ammonia until a red color is produced. To this solution add ten cc. of a 0.1% aqueous solution of sodium dimethyldithiocarbamate, and extract the brown solution with successive small portions of carbon tetrachloride until the extract is only faintly yellow.

After the copper has been extracted add one cc. of the standard copper solution (one cc. = 0.0001 gram of copper) to the extracted liquid, and extract the color thus produced with carbon tetrachloride, the extract being used as the comparison standard.

A blank determination on all materials must be run in exactly the same way as the sample.

The color of the extract from the sample is compared with the standard in Nessler tubes or a colorimeter, and the amount of copper estimated. The blank is also compared with the standard, the copper in the blank subtracted from the copper found in the sample, and the difference reported as % of copper on the original latex solids.

After the color has been developed and extracted, it is important that the solution not be left for a long time before comparison is made, as the color fades slowly.

Sodium diethyldithiocarbamate[12] may be used instead.

Manganese

The periodate method for manganese has given more reliable results in the author's laboratory than either the persulphate or bismuthate methods.

Weigh about 10 grams of the latex film into a large porcelain crucible and ash in a muffle furnace at as low a temperature as possible.

Add 5 to 15 grams of potassium bisulphate to the ash (depending on how much ash is present) and fuse cautiously until effervescence ceases, then put into the muffle at moderately low red heat, and fuse until the carbon particles are burned off.

Cool, dissolve in 80 cc. of 5% sulphuric acid, filter if necessary, add 5 cc. of 85% H_3PO_4, and 0.5 gram of periodic acid, and heat until the color appears, boiling 15 minutes thereafter. Cool, dilute to 100 cc. in a volumetric flask, and compare with a standard in a colorimeter or Nessler tubes.

The standard solution is prepared by diluting carefully standardized 0.05 *N* potassium permanganate to such a volume as to contain 0.02 mg. of manganese per cc. with distilled water which has been slightly acidified with sulphuric acid, boiled with a little periodic acid, and then cooled.

Starch

Starch may be detected in latex compounds by acidifying with hydrochloric acid and then adding a solution of iodine in potassium iodide. A blue or black coloration indicates starch.

Starch may be quantitatively determined by the following procedure:

Weigh 15 grams of the sample into a 500-cc. Erlenmeyer flask fitted with a glass condenser tube. Add 100 cc. of distilled water and four cc. of *N* sodium hydroxide and heat the mixture on a water bath, with air being blown over the surface until the ammonia is removed. Then cool the mixture and add water to replace any that may have evaporated. Add 20 cc. of concentrated hydrochloric acid rapidly while swirling the flask. This prevents the latex from coagulating to a solid mass. Add 40 cc. of 95% alcohol and 60 cc. of benzene, attach the flask to the condenser, and allow to reflux at gentle heat for two hours. Refluxing for longer periods was found to give lower results.

Remove the condenser and evaporate the benzene and alcohol by blowing air over the surface of the mixture on a steam bath. Decant the clear water layer, wash the rubber residue several times with hot water, and combine the washings with the extract. Add 10% potassium hydroxide solution to bring to neutrality and then bring just on the acid side with hydrochloric acid. Evaporate to a smaller volume, if necessary, and make up to volume in a volumetric flask of such a capacity that a 25-cc. aliquot will yield between 15 and 500 mg. of cuprous oxide on oxidation. A precipitate of about 100 mg. of cuprous oxide is most conveniently handled. Direct boiling of the solution containing the sugar over an open flame is to be avoided, as this decomposes some of the sugar and causes low results.

The dextrose in the extract is determined by Allihn's gravimetric method as follows:

REAGENT. Allihn's modification of Fehling's solution, prepared by mixing, immediately before use, equal volumes of (a) and (b).

(a) Copper sulphate solution: Dissolve 34,639

[11] W. A. Gibbons, R. H. Gerke, and H. C. Tingey, *Ind. Eng. Chem.*, (*Anal. Ed.*), 5, 299 (1933).
[12] L. A. Haddock and N. Evers, *Analyst*, 57, 495-7 (1932).

grams of copper sulphate ($CuSO_4.5H_2O$) in water and dilute to 500 cc.

(b) Alkaline tartrate solution: Dissolve 173 grams of Rochelle salt and 125 grams of potassium hydroxide in water and dilute to 500 cc.

DETERMINATION. Place 30 cc. of the copper sulphate solution, 30 cc. of the alkaline tartrate solution, and 60 cc. of water in a 250-cc. beaker, cover with a watch glass, and heat to boiling. From a pipet add 25 cc. of the material to be examined, and boil for exactly two minutes, keeping the beaker covered. Filter immediately through an asbestos Gooch, wash thoroughly with water at 60° C., once with acetone, and dry at 100° C. for 30 minutes.

The weight of dextrose corresponding to the weight of cuprous oxide may be obtained by referring to Allihn's sugar table.[13] The factor for converting dextrose to starch is 0.90. The weight of cuprous oxide may be converted to weight of dextrose or starch by multiplying by a factor, which varies with the weight of cuprous oxide and may be found by interpolating in Table I.

TABLE I. FACTOR FOR CONVERTING CUPROUS OXIDE TO DEXTROSE OR STARCH BY ALLIHN METHOD

Cu_2O Weighed	Dextrose per Mg. of Cu_2O	Starch per Mg. of Cu_2O	Cu_2O Weighed	Dextrose per Mg. of Cu_2O	Starch per Mg. of Cu_2O
Mg.	*Mg.*	*Mg.*	*Mg.*	*Mg.*	*Mg.*
15	0.520	0.468	150	0.452	0.407
20	0.493	0.443	200	0.454	0.409
40	0.467	0.420	300	0.457	0.411
60	0.459	0.413	400	0.468	0.421
80	0.455	0.410	500	0.478	0.430
100	0.453	0.408			

Sediment and Sludge

Fill a 15-cc. centrifuge tube to the mark with the sample, stopper, and centrifuge. Decant the latex off, fill the tube with a 2% solution of sodium oleate, shake up the sediment, and centrifuge again. Repeat until the sediment has been washed free from latex. Transfer the sediment to a weighed Gooch crucible, wash with water, dry, and weigh.

Results by methods which depend on measuring the volume of the sediment are not reliable, as they are too dependent on the time and speed of cntrifuging as well as the physical nature of the sediment.

Determination of Coagulum

Measure or weigh about 100 cc. of the sample and dilute with a 2% sodium oleate solution until it has the consistency of normal latex. Cut a circular piece of 80-mesh wire screen cloth of such a size that it will fit inside a five-cm. (two-inch) ordinary pipe union. Weigh and place tightly in the union and press down in the middle so that the upper surface will be concave. Clamp the pipe union in a vertical position. Pour the latex through the screen and wash with a 2% sodium oleate solution and finally with water. Remove the screen, dry, and weigh. If a large amount of coagulum is expected a smaller sample should be used.

[13] F. Allihn, *Z. Ver. Ruebenzucker-Ind.*, 1882, 32. Assoc. Official Agr. Chem., Methods of Analysis, 2nd ed., pp. 454-7 (1924).

Cotton Processing for Tire Fabric[1]

Fletcher Chadwick [2]

WHEN an imported bale of cotton is received, a woodman's hatchet is used to cut through the iron hoops of the bale, and layer by layer of cotton is fed into and caught up by prongs which divide the layers into large handfuls, and these clumps are then stacked in large bins or heaps in order to mix the various parts of a number of bales. After allowing sufficient time for the cotton to become loose and open, it is again fed by a traveling apron into a shaking or beating machine to loosen the heavy impurities; this is followed by breaking up the tuffs, dropping them into a strong current of air, and then from inside a revolving drum full of tiny holes air suction impinges the flock or tuffs against the surface of the perforated drum. The drum is stripped of its fibers on the opposite side and rolled up into something resembling a blanket or swiss roll.

The rolled blanket, after measuring and weighing, is in the next process slowly unrolled against many thousands of wire points, some traveling at high speeds, some medium speeds, and some slow. This process separates the cotton fiber by fiber from its neighbors, and forms a web which in turn is drawn into rope formation and suitably deposited into a coil container.

A process of combing to remove short length fibers follows after the fibers have been placed all in one direction, and by clamping down protruding fibers, removing those too short for the gab, and piecing up end to end the long fibers, a continuous length of good long staple and clean cotton is obtained.

To obtain a suitable thickness or number of fibers and to secure good spinning three operations of reducing thickness are usual, and this is done by placing two or more strands together and elongating them five to ten times their original length. The second and third operations repeat number one so that the finished roving ready for spinning is now many times longer and thinner.

The final thinning process is now reached, and this is accomplished by two, three, or four pairs of rollers, each succeeding pair running quicker than the previous pair. Twist is then added, and the spun yarn is suitably wound on to a bobbin. Up to this stage combed yarns produce 100 pounds from 150 pounds of raw cotton, and corded yarns 100 pounds from 120 pounds of cotton. Then follows a system of conditioning, clearing imperfections, such as slubs, snarls, and lumps, by micrometer-set gages and combs above and below the running threads.

Threads are assembled in multiples according to the number of plies to be twisted together, and wound upon cheeses, cones, or beams, the knots or piecings being made by a small machine held in the left hand. This machine ties the knot, pulls the threads tight, and cuts off the ends by one movement of the operator's thumb. In many cases, and where the yarns are required by tire makers for covers, two stages of twisting the strands is necessary to add resistance to friction, to impart extensibility and elasticity, and secure resiliency as well as to prevent strands opening out during flexing; hence the term compression yarns.

[1] Paper presented before a joint meeting of the London Sections of the Rubber Industry and the Textile Institute, March 2, 1937. Reprinted from *The India Rubber Journal*, Mar. 6, 1937, p. 302.

[2] Director, Preston Tyre Fabric Mfg. Co., Ltd.

Editorials

Colloid Chemistry Research

DR. E. A. Hauser will conduct at Massachusetts Institute of Technology a summer course during which individuals will be permitted to pursue in the laboratory specific problems in which they are interested. Details of the special course are presented on page 60 of this issue.

Worthwhile research has been conducted and is still in progress under the leadership of Dr. Hauser. The importance of colloid chemistry to the rubber industry is being realized more and more as the research divulges new facts regarding the action of colloids and the possibility of applying these facts to the preparation and use of rubber and compounding ingredients involved in rubber chemistry. This research is very definitely assisted by the use of the high-speed camera which was developed by Professor Edgerton of Massachusetts Institute of Technology.

Manufacturers of rubber products and compounding ingredients should consider seriously the possibility of sending representatives to this course with a prearranged plan of attack on a definite problem under the guidance of Dr. Hauser and thus avail themselves of the benefits of the knowledge thus far established. Even though the development of a particular problem may not be completed within the five weeks' course, very definite knowledge can be obtained by the individuals which may be used as a nucleus around which to lay plans for continued research.

Undoubtedly the results of investigation along colloid chemistry lines during the next few years, will materially affect the methods of preparation, the cost, and the quality of rubber products. Basic knowledge, foresight, and concerted research by the industry in general will add another chapter to the history of the development of rubber technology. By sending a representative who is qualified to carry on this research you will contribute your portion to the advancement which must sometime become a reality.

The Future Rubber Supply

THE April issue of INDIA RUBBER WORLD published a letter which had been received from the chairman of Rubber Shareholders' Association in England and which is presumed to represent the views of a group very closely allied to the International Rubber Regulation Committee. This letter implies that the representation on the International Rubber Regulation Committee is not sufficiently broad as it should be representative of every section of the industry and the letter also states:

"Doubtless its constitution will be amended when and if the renewal of the Scheme comes up for consideration."

When a shortcoming is once recognized, the next logical step is to review thoroughly all possibilities for improvement and then to take energetic action to eliminate that weakness.

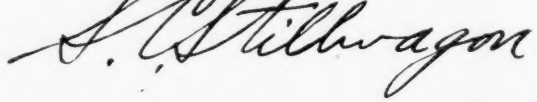
Because of the apparent lack of flexibility in plantation labor supply and the length of time required to bring new plantings to a mature yielding status, it is essential that an intelligently planned program be laid out far in advance of the changing demand and it is also necessary that a flexibility exist to take care of sudden nominal fluctuations in the demand.

The consumer is the best available source of information as to probable future requirements. The United States accounts for more than 50% of the entire world consumption of crude rubber and therefore should be amply and actively represented on the Committee in order that intelligent consideration may be given to future requirements which necessarily must be influenced by expected actual consumption and by the possibility of substitution of other materials for natural rubber, temporarily or permanently.

Statements from sources reported to be cognizant of the views of the Committee indicate that it honestly desires at all times to provide an ample supply of crude rubber at a price not excessive, but remunerative to an efficiently operated estate, while at the same time discouraging speculation.

This worthy aim can be promoted by immediate action: (1) to insure ample and active membership on the Committee which will represent all interests involved; (2) to establish as a goal a price which will be fair to those concerned; and (3) to investigate intensely the available supply of labor and producing trees in relation to the probable future demand.

Immediate attention should be given to possible conditions during the future period of several years. Is it not possible to amend at once the constitution of the Regulation Committee and start a program along the lines enumerated above with a view to building up and maintaining general confidence in the future operations of that body?



EDITOR

What the Rubber Chemists Are Doing

A. C. S. Rubber Division Activities

Spring Meeting

THE ninety-third meeting of the American Chemical Society was held at the University of North Carolina, Chapel Hill, N. C., during the week beginning April 12. Approximately 2,200 chemists, rubber technologists, consultants, and science educators were present at the general and divisional sessions.

About 125 attended the Rubber Division meetings Wednesday afternoon and Thursday morning at which were presented thirteen papers, abstracts of which were published in this journal last month.

Harold Gray, chairman of the Crude Rubber Committee, made a report on its activities. Specifications for testing normal and concentrated latex have been drawn up, submitted for criticism, revised, and resubmitted for final criticism. As soon as they are returned, another revision will be made, and the standard method will be published as soon as conclusions have been reached. The committee has agreed on methods for determining copper and manganese in crude rubber. Samples of light and dark colored smoked sheets sent in from the Far East showed plasticity substantially the same. The committee is also urging the use of specified coagulants on the plantations and proper marketing of the bales.

A short business meeting was presided over by Chairman H. Trumbull. Inasmuch as the executive committee is responsible for the publication of *Rubber Chemistry and Technology*, a motion was passed to add the editor and advertising manager to the executive committee.

R. P. Dinsmore reported for the committee appointed in September, 1936, to consider the invitation from the Institution of the Rubber Industry to take part in an international conference on rubber to be held in London in 1938. He stated that a canvass of members indicated active consideration as 20 to 22 signified their intention to attend, 60 were interested in such a conference, and 9 were willing to prepare papers. The resignation of the committee was accepted, and the chairman has asked A. E. Kemp, chairman of the Rubber Division's Papers Committee to pass upon papers to be presented. A committee on arrangements will be appointed later.

Mr. Trumbull has appointed S. M. Cadwell, chairman; C. C. Davis, and J. N. Street, to serve as a nominating committee to report nominations at the Rochester meeting in the fall.

On Wednesday evening the Rubber Division banquet at the Chapel Hill Country Club was well attended. Owing to the surroundings at Chapel Hill, opporunity was afforded those present to renew old acquaintances and discuss every-day problems of mutual interest.

New York Group

ON APRIL 2 the New York Group, Rubber Division, American Chemical Society, held an interesting meeting in the Building Trades Employers Association clubrooms, 2 Park Ave., New York, N. Y. At 7 p. m., 220 members and guests sat down to a chicken dinner.

C. A. Bartle, vice chairman of the group, conducted the meeting. A resolution was passed to send to Dr. Jack Miscal a telegram of condolence in respect to the sudden death of his father.

Dr. Ernst A. Hauser, associate professor of chemical engineering at Massachusetts Institute of Technology, Cambridge, Mass., and recognized authority, delivered a technical, but highly enjoyable talk on the subject colloid materials. Dr. Soellner, from the University College of London and first assistant to Professor Freundlich, world recognized authority on colloid chemistry, was introduced, and he told briefly of some of the work being done in London. Dr. Hans Albu, chief chemist of Beyersdorf & Co., Hamburg, Germany, acknowledged an introduction to the audience. A professional entertainer gave a humorous monologue.

In his talk Dr. Hauser pointed out that colloid chemistry and physics, according to modern definition, do not only cover the study of suspensions or emulsions in which the dispersed solid or liquid are present in extremely fine comminution, but that they also cover studies on surfaces or interfaces and reactions taking place therein. Colloid chemistry, therefore, is not of importance only in the field of rubber latex where problems of colloidal dispersion of the hydrocarbon, as well as of the compounding matter are predominant, but also work with crude milled rubber should be more considered from a colloidal point of view. The dispersion of compounding ingredients during the milling operation is governed by colloidal phenomena, and the properties of compounding ingredients depend largely on their surface condition.

Dr. Hauser indicated that a closer study of the surface condition and reactivity of the most generally used compounding ingredients would materially assist in obtaining a better insight into the changes in the properties of the compound occurring due to their addition. But, above all, a better knowledge of the compounding matter, from a colloidal viewpoint, would unquestionably permit different treatments of the compounding ingredients, so that, for instance, fillers which are today considered absolutely inert and therefore valued only as diluents of the mix could be transformed into fillers conferring definite valuable properties to the stock. A more correct understanding of these surface reactions should assist us in obtaining better control on accelerators adsorption, improving tear resistance in a variety of stocks, etc.

In referring to the problem of vulcanization of crude rubber as well as of latex, Dr. Hauser observed that we still lack a final answer to the problem. He expressed the hope that with our increased knowledge of rubber structure and its colloidal properties and materially improved methods of studying chemically and physically minute changes in the unsaturation of hydrocarbons, it should be possible to approach the problem from entirely new angles and obtain a satisfactory answer.

In concluding his talk, Dr. Hauser once more referred to latex, and after having pointed out that all concentration processes of latex, as protective evaporation, centrifuging, creaming, filtration, dialysis are based on typical colloidal reactions, he drew attention to the importance of the surface tension of latex or latex compounds in various applications, especially in dipping operations. Dr. Hauser briefly discussed work on surface tension now being conducted at M. I. T. by the use of the Edgerton high-speed motion camera technique and demonstrated a series of pictures of the bursting of a latex web obtained by dipping a fork-shaped glass rod into latex. The pictures were taken at a speed of about 2,000 exposures per second. He promised a detailed report of the work now

in progress as soon as the experiments pertaining to rubber are terminated.

June 12 has been decided upon as the date for the annual outing of the New York Group. The affair will be held at the Alp's Castle, Preakness, N. J., where the last two outings proved so successful. William W. Higgins, of the United Carbon Co., has accepted the chairmanship of the committee to replace K. J. Soule, who was forced to resign the post because of pressure of other matters. Mr. Higgins will be assisted by Wm. C. Lingvall, of the General Laboratories, United States Rubber Products, Inc., as assistant chairman, and an active committee.

There will be the usual sports events including soft ball game, horseshoe pitching, tennis, boccie, swimming, golf etc., as well as beer, hot dogs, dinner, and other entertainment. Much interest will center on the soft ball tournament for the INDIA RUBBER WORLD cup. The du Pont team won possession of it in 1935 and the Overman Tire team won it last year.

The Alp's Castle is about five miles beyond Paterson, N. J., and is easily reached by motor direct or by taxi from the Erie R.R. station in Paterson.

Los Angeles Group

THE Los Angeles Group, Rubber Division, A.C.S., held its meeting on April 6 at Hotel Mayfair, Los Angeles, Calif., with 88 members and guests present. President T. Kirk Hill presided.

Dr. A. A. Somerville, vice president, R. T. Vanderbilt Co., 230 Park Ave., New York, N. Y., repeated the talk previously given before the Rhode Island Rubber Club and the Chicago Group, on the value of the laboratory in the rubber industry and he showed moving pictures taken during his recent trip to Mexico. Dr. Somerville also demonstrated by graphs the relative potential markets for rubber materials in Canada, Mexico, and the United States. A humorous discourse was given by a professional entertainer.

Dick Newell, chairman of the golf committee, reported that a tournament held March 12 was well attended and that first prize was won by James W. Stull, of the Santa Fe Rubber Mills. Mr. Newell also announced that an unnamed donor would furnish a tournament award if at least 25 members would play in each tournament. Ed Royal, chairman of the program committee, brought up the question of a summer fishing trip, and keen interest was expressed by 20 of those present. R. D. Abbott reported present membership of 163.

Door prizes donated by W. D. Schwartz, of L. H. Butcher, and William Shawger, of the D. & M. Machine Works were won by Phil Ritter and B. E. Dougherty.

The next meeting on May 4 at the Hotel Mayfair will be the last indoor meeting of the season as summer meetings will be of a recreational nature.

Chicago Group

THE Chicago Group, Rubber Division, A. C. S., will meet May 7 at the Hotel Sherman, Chicago, Ill. After the dinner two technical papers are scheduled. The first is "A New Physical Test for Rubber Compounds" by H. D. Bainbridge, of International Smelting & Refining Co., Anaconda Division, East Chicago, Ind. The second speaker, F. G. Arnold, chief chemist of the Rapid Roller Co., Chicago, and a member of the group's executive committee, has selected the subject "The Use of Rubber and Synthetics in the Graphic Arts."

Boston Group

THE Boston Group, Rubber Division, A. C. S., will hold its next meeting the evening of May 7 at the Kenmore Hotel, Boston, Mass. The speaker will be A. R. Kemp, of Bell Telephone Laboratories, New York, N. Y., who will discuss "Developments in Rubber as a Dielectric Material."

Colloid Chemistry and Industry

IN RECENT years colloid chemistry and physics have become increasingly important in a wide variety of industrial enterprises. Our basic knowledge of the colloidal state of matter in general and of some of its typical reactions has become more profound, thereby opening up a larger field for application of this fertile branch of science. Industry itself is becoming more and more convinced of the fact that the application of this knowledge yields profitable results.

The Department of Chemical Engineering and the Summer Session Committee at Massachusetts Institute of Technology, Cambridge, Mass., have decided to offer another summer program this year in theoretical and applied colloid chemistry. This program, to begin on June 14, will be offered to men actively engaged in industry or in research who are desirous of extending their theoretical as well as practical knowledge of colloid chemistry and physics. The program will be of five weeks duration and will be given 5½ days a week, Mondays through Saturdays, beginning each day at 9 a.m. Lectures and round-table discussions will occupy eight hours a week, laboratory work 30 hours, and preparation 12 hours.

The lectures will include a general, but detailed survey of the fundamentals of colloid chemistry and physics with the main purpose of familiarizing the group with the basic colloid reactions, the differences and reasons of fundamental colloid reactions as compared to classical physicochemistry, and the reasons why colloid chemistry and physics are today considered as a special branch of science. The lectures will include a survey of the industrial applications of colloid chemistry by pointing out individual problems which demonstrate the increasing importance of colloid-chemical knowledge and research in a great variety of industrial activities. The round-table conferences and discussions will be devoted to individual specific topics to acquaint the group with the most recent developments in colloid chemical or physical scientific research, as well as in certain recent industrial developments.

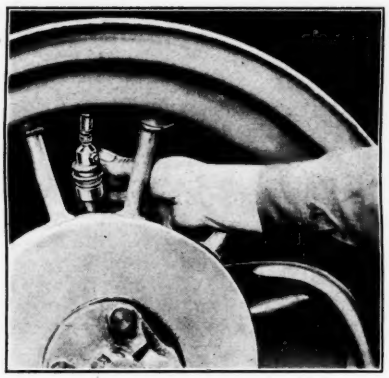
In the laboratory it is intended to familiarize those taking the program with different methods of determining surface tension, sedimentation analysis, rate of coagulation, production of colloidal suspensions and emulsions, destruction of emulsions, dialysis and electrodialysis, including base exchange reactions, ultrafiltration, pH determinations in colloidal systems, flocculation-rate determinations, the application of colorimetric methods in colloid chemistry, the study of monomolecular surface films, and so on. A thorough training in microscopy in its relation to colloidal research will be given. Special attention is drawn to the possibility of applying the high-efficiency fluorescent-light microscopy equipment, which has already proved itself valuable in a great number of studies pertaining to surface reactions. The laboratory work will enable those interested in special problems to carry out original research under appropriate supervision and with the facilities the Institute can offer.

Dr. E. A. Hauser, associate professor of chemical engineering, will be in charge of the program, assisted by an adequate number of instructors, to insure individual attention to all participants. The program will rate as seventeen credit hours for those interested in obtaining credit toward an advanced degree.

A knowledge of organic, inorganic, and physical chemistry and of physics equivalent to that of a college graduate in chemistry will be expected of each registrant. Applicants without a degree will be accepted provided their background of education and experience is such that they can profit from the work.

It is advisable to make registration at an early date, or at least inform the instructor in charge of the definite intention to take the program not later than June 1. To enable the instructors to make the necessary arrangements in facilities and to familiarize themselves with any specific problems, all those who desire to carry out research on some specific problem should send in special information in the form of a short outline of their idea, if possible not later than May 15. All applications and correspondence should be sent to Dr. E. A. Hauser, Massachusetts Institute of Technology, Cambridge, Mass. The tuition for the five weeks is $150, which includes the Summer Session Registration fee of $5.

New Machines and Appliances



Water Fill Adapter

Water Adapter for Tractor Tires

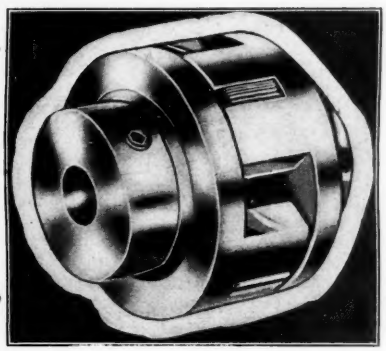
THIS adapter is recommended as a practical means of adding water to tractor tires to provide weight when increased traction is necessary. It quickly couples standard garden hose to the tire valve. The adapter uses a deflator button for releasing air that becomes trapped in the tire as the water rises in the tire. This makes it possible to use water under any pressure. A. Schrader's Son, 470 Vanderbilt Ave., Brooklyn, N. Y.

Laboratory Mixer

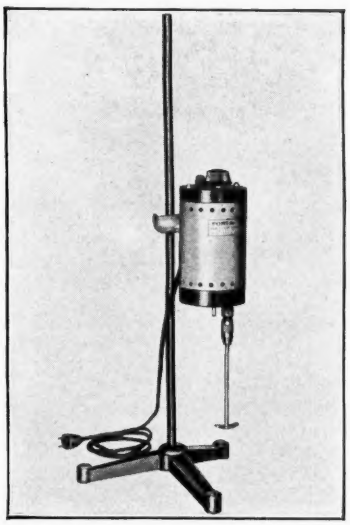
A SMALL laboratory mixer with adjustable speeds from 0 to 2,500 r.p.m. is now available. The range of possible consistencies of the liquids is wide because of the extra power through special gearing. The motor is explosion and corrosion proof, being shielded by Bakelite and aluminum housings, and will run 24 hours a day without doing any damage to the mechanism. It will run on either 110 A.C. or D.C. The chucks holding the propeller shafts will hold glass propeller rods as well as metal ones. Laboratory Equipment Co.

Francke Flexible Coupling

A NEW Francke coupling has been designed recently to meet the demand in the power transmission field for an all-steel fractional horsepower flexible coupling. This newest coupling design is recommended for fans, fuel pumps, generators, etc., up to ¾ h.p. at 1,800 r.p.m. and for shafts up to ¾-inch diameter. It provides free and independent lateral floating of the connected shafts, accurate alinement surfaces, an assembled one-piece all-steel center member, large load carrying surface, is torsionally resilient, mechanically flexible, and silent at any speed. It is fully described in Francke Bulletin No. 53, a copy of which is available upon request. John Waldron Corp., New Brunswick, N. J.



Light-Duty Flexible Coupling



Power Mix

Type "E" Reducing Valve

High-Pressure Reducing Valve

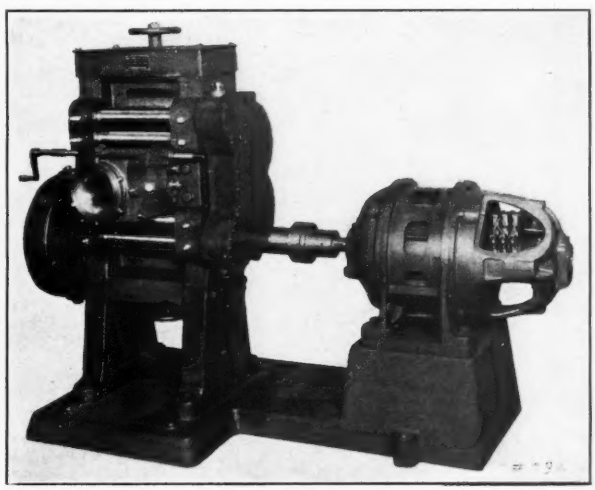
AMONG the important features of this valve are the forged steel body, the stainless steel internal metal parts, the special formed packing, which is superior to leather and resistant to oil as well as water, and the balancing of the pressure on the valve seat by means of a piston that minimizes the effect of high initial pressures. Atlas Valve Co.

Lead Stripping Machine

THIS machine was designed to handle all diameters of lead sheath, round or oval, up to 4 inches. All the bearings are made of bronze, and the gears are enclosed in oil tight cases. Alemite lubrication is used on all shaft and roll bearings. The 10 to 15 h.p. variable speed motor mounted on a rigid base is connected to the machine by a flexible coupling. The guide and splitting head are adjustable. John Robertson Co., 121-137 Water St., Brooklyn, N. Y.

Liquid Spray Pump

THIS new fluid circulating pump, type QB, offers an efficient, economical, and safe method of delivering clear varnish, clear lacquer, and other non-pigmented material from the shipping container direct to the spray gun. It eliminates the hazards of pressure equipment when used on old or weak drums.



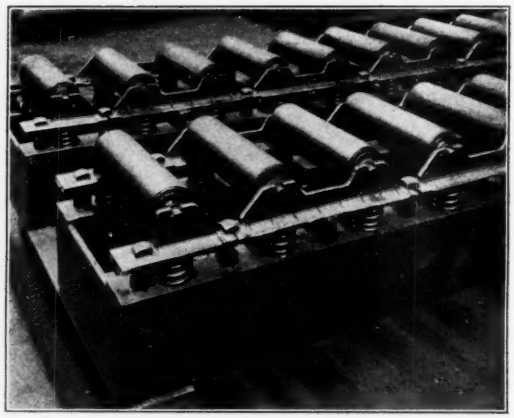
Robertson Lead Stripper

The pump draws the material out of the drum and generates sufficient pressure in the pump head to feed the fluid to the spray gun at the correct, unvarying pressure as predetermined, but with no pressure inside of the drum. The entire unit is self-contained and can be changed from one drum to another in a very short time. Supplied in either electric or air motor-driven type the unit consists of (1) a rugged steel base plate on which is mounted the motor, pump, relief valve, and fluid regulator, and (2) a fluid suction and return assembly, which can be inserted in any drum with ¾-inch or larger opening. The pump, equipped with patented rotary type piston, is adjustable to deliver pressure from 25 to 80 pounds. The relief valve in conjunction with the blow-back feature of the regulator allows the fluid in the hose to be forced back into the drum. The unit and hose can be cleaned each day after use. An adjustable sliding collar on the tube protects the drum opening from dirt or any other foreign material.

The electric-type unit has ⅙ h.p., 1,140 r.p.m., explosion-proof motor and conduit. The air-type unit has a type QS air motor which for a fluid pressure of 45 pounds will rotate about 700 r.p.m. and will consume approximately 8 to 8½ cubic feet of air per minute. The DeVilbiss Co.

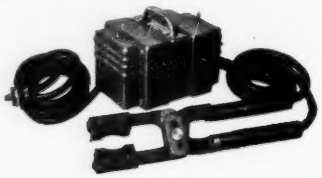
Shock-Absorbing Roller Conveyer

DURING the past six months actual performance tests have prompted the announcement of the Mathews shock-absorbing (resiliently mounted) roller conveyer. Each side rail of the frame supporting the bearings for the rollers is divided into sections, each of which supports not more than two rollers that run in their bearings on the sectional frame. Each section is supported by coil springs located directly under each bearing. Thus under load the spring compresses and permits the roller to seek its proper plane level so that each roller bearing receives a load equal to the load of the other bearings.



Resilient Conveyor Mounting

This construction eliminates the condition in the case of rigidly supported rollers where wear on individual bearings permits that roller to be in a lower plane and prevents it from taking its share of the load. The new construction will insure distribution of the load over all rollers in contact with the object being conveyed and will prevent an overload on part of the bearings. It should result in longer bearing life and easier running rollers throughout the entire conveyer. Mathews Conveyer Co.

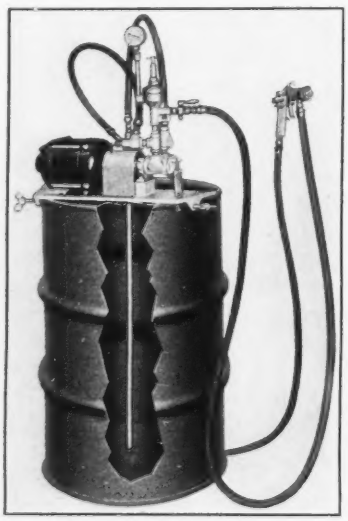


No. 10 Ideal Soldering Tool

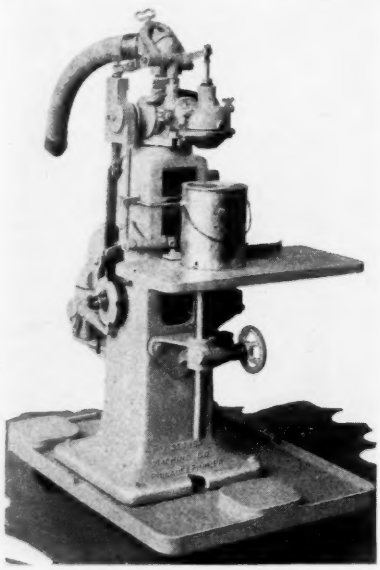
Thermo-Grip Pliers

THIS tool, No. 10 Ideal, was developed to handle continuously sweated joints up to three inches and, intermittently, joints greater than three inches, as well as to solder lugs up to and including 1,050 amperes. The standard units operate on 100 to 120 A.C. (50-60 cycles) drawing about 25 amperes on high and 18 amperes on low; the voltages on the secondary are six on high and 5½ on low.

The carbon blocks through which the current passes into the object to be heated are inserted in bronze jaws with bronze clamps. The transformer is fully enclosed, has a cast-iron frame, and is supplied with a cadmium plated handle for ease of handling. The distinctive features of this tool are: it sweats joints without unsweating adjacent connections; it heats the work evenly on both sides and eliminates open flame hazards. The nominal time required for making a three-inch sweated copper pipe is three to four minutes and for soldering a 2,000,000 C.M. cable into a 1,050 ampere lug is five to six minutes. Ideal Commutator Dresser Co.



New Fluid Circulation Pump



Simplex Filling Machine

Cement Filling Machine

A NEW Simplex filling machine, suitable for filling cans and tubes with rubber cements, has a wide range of adaptability to containers from 1/32-gallon (four ounces) to one quart at the rate of 30 to 40 per minute. An automatic attachment to produce multiple strokes enables the filling of larger containers. Some of the outstanding features are: the ease of cleaning and changing over from one material to another; minimizing of any tendency to drip by a "suck back" and non-drip nozzle; piston and three-way valve for filling; and special metal, if desired, for parts coming in contact with the product. The machine is direct motor driven and can be supplied with a hose or hopper feed. F. J. Stokes Machine Co.

New Goods and Specialties

Basketball Bladders

Tyrotex Basketball Bladder

THIS new product of the Tyer Rubber Co. is especially adapted for the laceless and molded basketball and is also produced in official sizes for football, soccer, and volley balls. The unusual tensile strength of this product, approximately 4,900 pounds per square inch, makes this bladder outstanding in its field. The illustration shows two identical bladders, one blown to its normal size as in an official basketball and the other one inflated to 41-inch diameter. On the left is H. G. Tyer, vice president of the Tyer Rubber Co., manufacturer of these bladders.

Transparent Rubber Umbrella

THE new Visibrella is made with clear transparent Pliofilm rubber taking the place of the silk in the usual construction of umbrellas. The handle, ribs, and frame are of the usual type except that because of their exposure to being observed, the metal parts are lacquered in harmonious colors. The Pliofilm, a product of Goodyear Tire & Rubber Co., is cut in triangular pieces which are stitched together at the ribs, and is artistically reenforced at the points of attachment to the frame.

The Visibrella is made in different sizes for men, women, and children in the colors which are standard for "Pliofilm." The visibility permitted because of the transparency of the rubber is a real safeguard in preventing accidents to children and pedestrians. The Haas-Jordan Co.

Rubber Protective Paint without Primer

HERETOFORE a separate primer has been necessary before rubber coating could be applied to metal or other surfaces to protect against corrosion. The research laboratory of the Self-Vulcanizing Rubber Co. has carried on an exhaustive research and is now announcing Selfvulc Insulator. This is a rubber compound which incorporates the quality of a primer with a self-curing, cold-curing, rubber which can be applied by unskilled labor by dipping, spraying, or by means of hand brushing.

The New Visibrella

This new product makes a steadfast bond in one application, but repeat coats to any desired thickness may be added. A vulcanizing period of one hour in the air preferably at room temperature without other heat is all that is required for first or following coats. There is practically no shrinkage in application; the product is 90% pure rubber, and it gives a very smooth, enamel-like finish on any surface.

Aside from being an insulator and waterproofer, it resists and stops corrosion caused by alkalies, salt solutions, mild acids and their fumes, and is used for covering girders, ducts, ventilators, hoods, pipes (exterior and interior), tanks, vats, tubs, walls, ceilings, bodies and frames of tank cars, structural steel, etc.

Oil-Proof Synthetic-Rubber Coated Glove

A NEW glove, specially designed to meet the requirements of the oil and gasoline worker, has been developed by the Pioneer Rubber Co. By coating the ordinary fabric gloves in "Thiokol," an oil-proof synthetic rubber, the fabric glove becomes resistant to oil, grease, gasoline, and acids. Its extraordinary wear resistance makes this glove ideal for the workman who is confronted with the destroying evils of gasoline and oil. Another featured point of the new product is the ventilation. It is claimed that the porous coating prevents hand sweating in both summer and winter, making this soft, pliable glove more desirable than the cover-all type. However the gloves may be coated all over for particularly rigorous conditions.

"Thiokol" Coated Gloves

Rubber Industry in America

LEGAL

Latex Court Decision

For the benefit of those interested this article is a verbatim reprint in full of the opinion handed down April 23, 1937, by Elisha H. Brewster, Judge, District Court of the United States, District of Massachusetts in Equity Nos. 4,023 and 4,281, Vultex Corp. of America et al. v. Heveatex Corp. et al.

District Court of the United States
District of Massachusetts

In Equity
Nos. 4,023 and 4,281

Vultex Corporation of America et al.
v.
Heveatex Corporation et al.

OPINION
April 23, 1937

BREWSTER, J. These two infringement suits were tried together and may be conveniently considered in one opinion. No. 4,023 charges infringement of United States Letters Patent No. 1,443,149, and No. 4,281 charges infringement of United States Letters Patent No. 1,682,857.

Defendants attack the validity of the claims involved and deny infringement.

The following, so far as it contains statement of facts and conclusions of law, may be deemed a compliance with Equity Rule 31½.

To understand the issues, it may be well to preface this opinion with a brief statement respecting the art involved in the controversy.

The crude rubber of commerce is obtained from a milky looking, watery fluid, called "Latex", in which minute particles of rubber, or rubber hydrocarbon, are in suspension. Latex is an unstable fluid, and unless a preservative, such as ammonia, is mixed with it, it will easily coagulate, or spoil. The crude rubber is obtained by coagulating or separating the solids from the fluid. This, from an early time, has been accomplished in several ways not here material. The crude rubber thus obtained is plastic, is peculiarly susceptible to changes of temperature and readily affected by solvents, and is inelastic when broken down on a mill. In 1840, Goodyear discovered that the physical and mechanical qualities of crude rubber might be changed by the interaction of sulphur and rubber.

From that date the process of vulcanizing rubber has been well known in the art. Vulcanization has been accomplished by mixing with the rubber various ingredients. The process of vulcanization involves a progressive reaction, and as it progresses the crude rubber loses its adhesiveness, its ability to absorb solvent and its sensitivity to temperature changes, and on milling becomes less plastic and more elastic.

I take it from the evidence in the case that, generally speaking, vulcanization is not complete until the mixture has been subjected to heat of a greater or less degree, the amount and duration of heat depending upon the nature and quantities of the ingredients used in the vulcanizing process. For a great many years prior to the entry into the art by Dr. Schidrowitz with the first patent in suit, the vulcanizing process has been applied to the crude rubber after coagulation and in a dry form. The materials that Dr. Schidrowitz used were known to the prior art, the sulphur or the sulphur compounds as vulcanizing ingredients, the accelerators of these vulcanizing ingredients, and the activators of the accelerators. Their effects were only known on crude rubber, however, as early as 1864, processes had been patented in which the vulcanizing ingredients were added to the latex before coagulation. [See Hancock et al., British No. 3, 110 (1864); Bloxam, British No. 25,291 (1905); Clarkson, British No. 18,497 (1910); Schidrowitz et al., U. S. No. 1,156,184 (1915).] In Hopkinson, U. S. No. 1,542,388, the use of accelerators in the vulcanizing compound is indicated.

While in some of these patents, notably Schidrowitz and Clarkson, it was suggested that latex might be completely vulcanized before coagulation, it was Dr. Schidrowitz, in the first patent in suit, who first pointed out how this vulcanization could be accomplished.

In his application he recites that he had discovered that substantially uncoagulated caoutchouc-containing material may be vulcanized without prior coagulation of the caoutchouc. This process involved the use of a preservative agent, sulphur, zinc oxide, and a small quantity of piperidine. These ingredients are stirred into the latex and the whole placed in the vulcanizer and subjected to a relatively high degree of temperature for a stated period. After vulcanizing, the liquid is strained and thereafter the rubber may be separated from the strained solution either by evaporation or coagulation, followed by washing and drying by any desired method.

The examples shown in this patent involved low accelerators and high degree of heat. There are two process claims and two product claims said to be infringed. These process claims cover the process for the manufacture of a vulcanized caoutchouc composition, which comprises submitting rubber latex in an alkaline condition to vulcanization. The product claimed is "a novel composition of matter; vulcanized substantially uncoagulated rubber latex."

The process of the first patent, commonly referred to as the "hot process," was old when applied to dry rubber after coagulation. Reading the claims in the light of the prior art, they must be limited to a process which gives a completely vulcanized product, and by this I mean a product which is stable, requiring no further vulcanizing steps after coagulation. When latex is vulcanized according to the first Schidrowitz patent, there will be no progressive change in the degree of vulcanization, and the coagulated rubber will be completely vulcanized when separated from the fluid. Of course there will be different degrees of vulcanization, depending upon the relative proportion of the ingredients mixed with the latex. In this stable characteristic of the vulcanized latex lies the important distinction between the Schidrowitz process and those which had preceded it. The adding of the vulcanizing ingredients to the latex will result, as time goes on, in a progressive change in the latex unless it has been brought to the point of stability by the application of heat or some well-recognized method of completely vulcanizing the latex or coagulum.

To state the proposition differently, the prior art practices inevitably produced in the course of time changes in the latex in the direction of vulcanization, but the prior art practice did not give a stable vulcanized product which required no further vulcanizing steps, as is shown in the Schidrowitz patents.

The word "defendant", hereinafter used, refers to Heveatex Corp. unless otherwise indicated. The defendant's practice is that of the prior art and not that of either of the patents in suit. It is one which the defendant Crockett had followed since 1926, before the plaintiffs had acquired the Schidrowitz patents, and one which the plaintiffs still follow in producing a compounded latex which they do not sell under the name of "vultex", the trade name plaintiffs have adopted for the products manufactured according to the patents in suit.

The vulcanizing agents which the defendant mixed with the latex are the same or similar to those shown in the patents, but they are mixed in different proportions and no heat treatment or other vulcanizing step whatsoever is performed by the defendant upon its compound. Its compounded latices are not vulcanized latices. They do not

possess that essential characteristic of stability which marked Schidrowitz's advance over the prior art. Defendant's product must be subjected to some known vulcanizing process by the user before it can be utilized for any purpose which calls for a vulcanized article.

Plaintiffs attempted to show that the defendant's latex was vulcanized when sold, but experiments in court on defendant's product, a month old, which had been made according to the formula relied upon as infringing, showed that the coagulum was not a vulcanized product. The experts did not agree as to the extent of vulcanization in the samples of the defendant's product which plaintiffs had obtained, but the evidence goes not further than to establish that defendant's product was manifesting changes in physical properties which suggested a progressive condition naturally resulting from a lapse of time. The evidence falls short of proving that defendant's compounds were completely vulcanized latices.

I find and rule, therefore, that the claims in suit of the first patent, No. 1,443,149, are valid, but not infringed.

With respect to the second patent in suit, the alleged invention consists only in a modification of the processes described in the first patent (1,443,149). This second discovery is said to be "characterized essentially by vulcanizing the latex-mixing under the conditions prescribed at a temperature below that ordinarily employed in hot methods of vulcanization".

This end is accomplished by either the application of heat "at a suitable temperature below the usual boiling point of water" or the use of such quantities of sulphur, zinc oxide, and ultra-accelerator as will produce the desired change in the product within three or four days at room temperature. Thereupon, the latex, if there is no coalescence, is strained to remove zinc oxide, excess sulphur, and accelerator. Removal of the uncombined sulphur prevents any further change in the product upon standing, thus insuring in the latex the stability which is the earmark of a vulcanized product.

The claims of this patent are all process claims, of which Claims 7, 8, 12 and 16 are alleged to be infringed. Claim 8 is sufficiently illustrative:

> "8. The process for the manufacture of vulcanized rubber compositions which comprises vulcanizing substantially uncoagulated rubber latex in an alkaline condition in presence of an accelerator of vulcanization and a promoter for said accelerator at a temperature below those ordinarily employed in hot vulcanizing methods under such conditions as to preclude any substantial coagulation of the rubber during the vulcanization."

Schidrowitz's application for this patent was involved in several interference proceedings, none of which was based upon any claim now in controversy. Nevertheless, they are of some significance as bearing upon the scope of the invention; for example, on Schidrowitz's motion, the patent examiner dissolved, as not disclosing novelty, a count reading as follows:

> "A process for preparing a latex composition which comprises combining with latex, containing an alkali preservative, a high-powered organic accelerator, stable toward the preservative and which does not coagulate the latex."

Again, in an interference with one Gibbons, priority was awarded to Gibbons on a count which later became his only claim in patent No. 1,654,167 (1927). This claim covered a "process of manufacturing vulcanized rubber compositions which comprises the drying and vulcanization of substantially uncoagulated rubber latex containing an organic accelerator capable of effecting vulcanization at temperatures below those ordinarily employed in hot vulcanization methods."

A study of the Patent Office records leaves no doubt that all that Schidrowitz claimed or could claim was a process that completely vulcanized the rubber particles before coagulation at a temperature below those ordinarily employed in hot vulcanizing methods. As thus limited by the prior art, defendant's latices do not infringe.

On the question of infringement, I concur fully in the following statement, appearing in defendant's brief, which has equal application to both patents in suit.

> "The patents do not purport to cover a process or product like the defendant's. Defendant's product is not a vulcanized latex nor does defendant use any process which produces a vulcanized latex. An essential characteristic of any vulcanized product, whether it be rubber in dry form or rubber particles suspended in latex, is, as above pointed out, that by the treatment received they require fixed and determined characteristics which do not change materially with the lapse of time. Defendant does not submit its compounded latices to any vulcanizing step whatsoever, and its compounded latices, therefore, do not acquire the characteristics of a vulcanized product. On the contrary, their qualities change progressively as time goes on, and a heat treatment applied by the customer to the coagulated and dried product made from the latex is required in order to vulcanize and thus to stabilize the qualities of the resulting product."

With respect to the second patent, the further question arises whether the process claims are valid as showing invention over the first patent.

From the file wrapper, it appears that the Patent Office allowed 22 process claims originally presented in Schidrowitz's application, after first rejecting all of them on the first patent in suit in view of other references cited.

To overcome this official action, the applicant pointed out that the present invention differed from the earlier patent in that the present process consisted in directly vulcanizing the latex in an uncoagulated state at a low temperature. This end was attained by the use of so-called ultra or high-powered accelerators. The applicant disclaimed any intention of securing a monopoly on any particular accelerating ingredient. The defendant contends that this slight modification of the first patent does not constitute invention. The procedure indicated differs from the procedure indicated in the first patent only in the same way that the so-called "cold vulcanization process" as applied to crude dry rubber, currently in use before Schidrowitz's invention was made, differs from the older "hot vulcanization process". The vulcanizing step, proposed in the second patent, is that known as "cold vulcanization".

When the attorneys for Dr. Schidrowitz were pressing their motion to dissolve the interference, to which reference has already been made, it was argued that there was "no novelty in substituting the high-powered accelerators previously used for the vulcanization of rubber to a latex where accelerators of a lower order and even of the same order had been previously added to latex prior to the coagulation thereof."

I am inclined to think that this argument was sound. It would seem to be obvious to any chemist, endowed with a reasonable knowledge of the art of vulcanizing rubber, that the cold vulcanizing process, well-known in its application to dry rubber, could likewise be applied in a process of vulcanizing the latex. This, in my opinion, would not amount to a patentable discovery.

The presumption which usually attends the granting of a patent is weakened by the disclosures of the file wrapper. Furthermore, it ought not to be indulged in a case where the effect is to extend the life of an earlier patent by sustaining a later patent upon a slight and obvious modification of the former.

I have, therefore, reached the conclusion with respect to the second patent that none of the claims relied upon are valid, and if valid they are not infringed.

A decree may be entered, therefore, dismissing both bills of complaint.

Patent Suits

1,374,505 (*a*), E. Hopkinson, Method of making motor vehicle tires; 1,493,674, same, Pneumatic tire casing for motor vehicles; 1,310,701, same, Machine for building pneumatic tire casings; 1,242,073, J. D. Tew, Method of making tire casings; 1,162,479, A. H. Harris, Method of manufacturing cord-wound tires; 1,480,719, J. R. Gammeter, Method and apparatus for making or manipulating tires; 1,286,107, I. R. Renner, Tire-forming tube; 1,259,289, same, Cord tire and method of making; 1,370,102, J. L. Dykes, Tire-band stretching and vulcanizing machine; 1,370,100, same, Tire-band making machine; 1,370,101, same, Tire-band

(*Continued on page* 70)

OBITUARY

Charles J. C. Davol

Charles J. C. Davol

AFTER a three-week illness Charles Joseph C. Davol, president and treasurer of the Davol Rubber Co., Providence, R. I., died in a New York hospital on April 11. In 1885 he joined the company his father had founded in 1870 and later became general manager, which post he retained until July 1, 1933. In 1909 upon his father's death Charles Davol was elected president and treasurer of the company.

The deceased was born in Brooklyn, N. Y., April 14, 1868. He was educated in the public schools of Providence and at Mowry & Goff's Ensign and Classical School, graduating in 1885.

Mr. Davol was a man of varied activities. He was an ardent sportsman, a dog fancier, a breeder of pedigree cattle, an enthusiastic automobilist and yachtsman, and fond of traveling. During his lifetime he belonged to the following clubs: Pointer Club of America; English Setter Club of America; Agawam Hunt Club; National Audubon Association of America; New York, Eastern, Boston, Larchmont, Rhode Island, Bristol, and East Greenwich Yacht clubs; Circumnavigators' Club of New York; Rocky Mountain Club; National Geographic Society; Society of Mayflower Descendents; Society of Colonial Wars; Sons of the American Revolution; Rhode Island Historical Society; Providence Athenaeum; Commercial Club; Economic Club; Rhode Island Hospital Corp.; Navy League of the United States; American Defense Society; National Committee; and Rubber Manufacturers Association, Inc.

Surviving are his wife and his nephew, Walter L. Davol, assistant managing executive of the Davol plant.

Under the provisions of Mr. Davol's will, the Rhode Island Hospital and Brown University eventually will share the bulk of the estate, estimated at approximately $2,000,000. The will was probated at North Kingstown. After the specific bequest of $5,000 to the hospital for establishing a free bed and bequest of personal and house effects and certain real estate to the widow, the residuary estate is placed in trust, with the provision that all income go to Mrs. Davol during her life and to the nephew, Walter L. Davol, after her death. Upon the termination of the trust with the death of both the widow and the nephew, the entire residue of the estate is to be divided, two-thirds going to the Rhode Island Hospital and one-third to Brown University.

Robert V. Whitehead

ROBERT V. WHITEHEAD, vice president and treasurer of the Trenton Saving Fund Society and formerly a director of Whitehead Brothers Rubber Co., Trenton, died suddenly on April 14. He was a graduate of the State Model School and a member of Trinity Episcopal Cathedral, Trenton Club, Trenton Historical Society, and Sons of the Revolution. He was a widower and is survived by a son. Burial was in Trenton.

Henry T. Helm

HENRY THEODORE HELM, veteran rubber man, died April 16 in New York, N. Y., after a long illness. He had been connected with the crude rubber industry since early in 1909 when he entered the employ of Continental-Mexican Rubber Co. at its factory in Torreon, Mexico, where he remained several years until revolutionary conditions in Mexico compelled Continental to suspend operations there. Mr. Helm again became connected with the same company about October 1, 1935, as its general manager in Mexico, but ill health compelled him to return to New York about December 1, 1936.

He went to the Far East in 1917 and established the Colombo business of Wilson, Holgate Co. (Ceylon), Ltd. He remained as managing director until August, 1920, when he came to New York on leave of absence. Deciding not to return to the Far East, Mr. Helm then became associated with F. R. Henderson & Co. in its foreign produce department and remained with that firm and its successor companies until the latter part of 1928. Next, from November 1, 1928, to January 31, 1931, he worked in the commodity department of F. B. Keech & Co. Then until May 16, 1933, Mr. Helm was employed by Chicle Development Co., handling its business in Guatemala and Mexico and subsequently was manager of the Laguna Corp., Laguna del Carmen, Mexico, for about a year and a half. Then from January 1, 1935, to September 30, 1935, Mr. Helm was employed in the commodities department of Harriman & Keech.

The deceased was a charter member of The Rubber Exchange of New York, Inc., in 1925 and was active in its formation and operations. He also belonged to the New York Hide Exchange, Inc., from the time of its inception and thereby became a member of Commodity Exchange, Inc., upon the consolidation of the Hide, Metal, Rubber, and Silk exchanges in May, 1933.

His wife survives him.

A. F. Odell

DR. ALLAN FULSON ODELL, 51, chemical director of the Arlington, N. J., plant of E. I. du Pont de Nemours & Co., Inc., with which firm he had spent twenty years, the last seven in the plastics department, died April 10. A graduate of Vanderbilt University (1906), Dr. Odell taught several years before engaging in industrial work. He belonged to several chemical societies and the Masons.

Surviving are his wife, two sons, two daughters, a brother, and a sister.

Funeral services were held April 13.

F. B. McIlroy

FRANK BERRY McILROY, retired rubber goods manufacturer, died at his home in Hammond, Ind., March 25. He was born in Brampton, Ont., Canada, October 21, 1860, and attended the schools of his native land.

He began in business as office boy in the Chicago, Ill., office of a Trenton, N. J., rubber manufacturing company and eventually was promoted to the position of salesman. Twenty-five years ago he launched his own business, The McIlroy Belting & Hose Co.,

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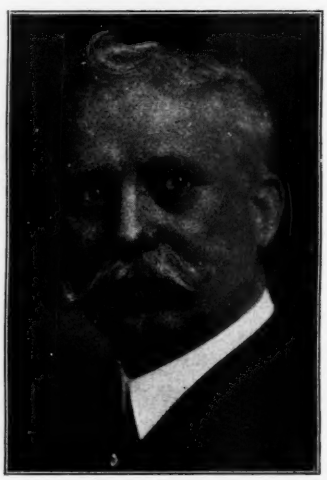


F. B. McIlroy

EASTERN AND SOUTHERN

ALTHOUGH some weak spots were indicated last month, the trend of business continues to improve. As most retailers are well covered on their requirements for the present, less activity occurred in the wholesale markets. Reports of increasing consumer resistance to higher retail prices and labor disturbances in some industrial lines created a feeling of uncertainty in the leading markets.

Industrial operations moved along favorably except in sections affected by unsettled labor conditions, with plants in many divisions continuing to maintain capacity schedules. Building activity continued to show sharp gains over a year ago.

One authority reports factory employment at about the 1929 figure; while another complains of a shortage of skilled labor.

Another report states that accompanying continued recovery in the volume of production and trade and some advance in commodity prices, profits of 727 industrial and mercantile companies in 1936 rose 50% over the 1935 level, or virtually the same percentage gain as occurred between 1934 and1935. The net profits of these companies rose 26% above the 1930 total, but remained 26% below the 1929 figure. The number of individual companies reporting net losses in 1936 amounted to 7.6% of the total tabulated, as against 15.7% of the total in 1935.

All except four of the 37 groups of industrial and mercantile companies had larger profits in 1936 than in the previous year, and in several instances the percentage increases were very large. Prominent among the groups reporting increases were the aviation, heating and plumbing, railroad equipment, chain restaurant, tire and rubber, shipping, and steel companies.

The Class I railroads, following deficits sustained in each year from 1932 to 1935, earned a moderate amount in excess of interest and other fixed charges in 1936. This amount, however, was only about one-third as large as in 1930 and one-fifth of the 1929 net income. Net income of 62 public utility companies other than telephone companies rose 10% in 1936, but remained 28% below the 1930 total and 30% less than in 1929.

In the South business showed further increases. Wholesale business was maintained substantially better than during the same time last year. Construction activity remained on a vastly improved scale. Reflecting further improvement in private employment and payrolls, relief lists continued to decline. Crop conditions generally were reported "most satisfactory," and a feeling of optimism prevails in rural districts. The petroleum industry, likewise continues to reflect prosperity.

S. C. I. Meeting

A meeting of the Society of Chemical Industry, American Section, held jointly with the American Chemical Society, took place April 9 at The Chemists' Club, 52 E. 41st St., New York, N. Y., with James G. Vail as chairman. The guest speaker was Professor James E. Kendall, on an American tour from Edinburgh, Scotland, who spoke on "Liquids and Solutions."

Professor Kendall summarized the more important results of a symposium held in Edinburgh in September, 1936.

The papers presented there on pure liquids included a number which delved down to the fundamental nature of the liquid state. Other papers were largely experimental, describing new methods of investigation, such as the examination of liquids by X-rays, Raman and infra-red spectra, and the absorption of very high-frequency sound waves.

The papers on solutions presented at the September symposium covered such diverse topics as laws of solubility, activities, association, the structure of molecular complexes, and refractometric and magnetic data. Just as in the case of pure liquids, it was shown that the basic ideas on molecular interaction which are now taking shape appear to be coordinating the most diverse lines of approach and will, in time, lead to a clear conception on the nature of solutions.

Professor Kendall, who taught chemistry in New York from 1913 to 1928, has done considerable work with ionic dissociation, addition compound formation, viscosity, and separation of isotopes and rare earths.

Du Pont Chemical Exhibit

At the New York Museum of Science & Industry, 30 Rockefeller Plaza, New York, N. Y., is on display an exhibit organized by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., intended to demonstrate to the layman and to the chemist alike the vast possibilities for chemistry to affect the everyday life of each individual. In a number of instances equipment is installed that the observer may press a button, and the demonstration will proceed automatically.

President Lammot du Pont, speaking at the preview on March 31, declared that scientific research correctly administered should overcome conditions such as have been experienced during recent years and that it already has improved the general welfare and happiness of humanity by creating employment, raising wages, developing new products, and making possible a more complete life.

Then Dr. C. M. Stine, vice president and director of research of the du Pont company, traced the history of industrial development through the first use of steam power, the discovery and harnessing of electricity, to the present period of new product development through the agency of chemistry. Dr. Frank B. Jewett, president of the Museum, introduced the speakers with a few brief remarks regarding the aims of the Museum.

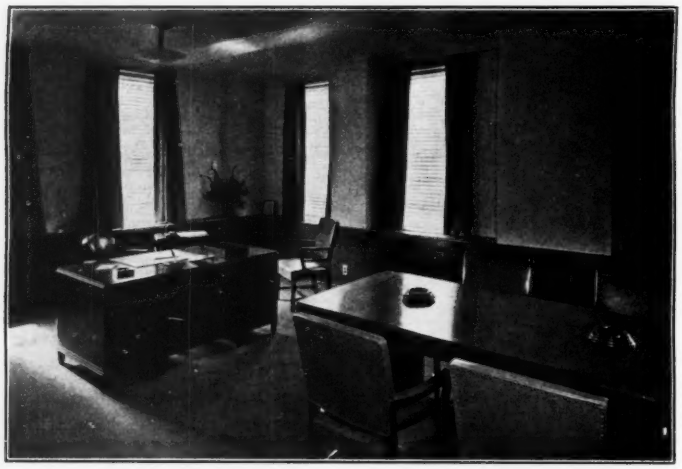
A fashion show was the first feature of the opening night. Curtains of rich rayon fabrics were parted by twin pages, and the promenade of models began. Illustrating the newer scientific developments in dyestuffs, bleaches, water-repellent fabrics, plastics, and rayons, the costumes featured such achievements as satin gowns and sport dresses of materials which the chemical laboratory had rendered resistant to rain spots; hats of cellophane; shoes with scuffless heels; and gloves bleached by chemical methods in hours whereas old-time methods required weeks.

On the mezzanine floor many new materials and processes were displayed and explained. Of particular interest was the demonstration of a new flame-proofing agent for textiles and paper, which has just been developed by du Pont chemists. Fabrics treated with this chemical are not fire-proof in the sense that they cannot be burned, but they are flame-proof in that they do not blaze or smolder and consequently will not spread a fire. This chemical does not appreciably influence the strength of textiles or paper, the dyestuffs commonly used, or the feel or appearance of the material. Du Pont expects soon to manufacture this new material on a commercial scale.

Twin tensile tests using rings of Neoprene and natural rubber which had been soaked in hot oil demonstrated the higher resistance of Neoprene to oil. Other products on display, included: "Freon," a non-poisonous refrigerant having a temperature of —22° C. made by treating a chlorinated hydrocarbon such as carbon tetrachloride with fluorine gas; plastics; synthetic sponges; "Soapless Soaps"; heat resisting lacquers and enamels; new plating materials; Zerone, a combination anti-freeze and anti-rust; Pyroxylin-coated fabrics; synthetic ammonia requiring pressures as high as 15,000 pounds per square inch in its manufacture; and the plastics "Plastacele," derived from cellulose; and "Lucite," a tough crystal-clear material in the manufacture of which is used such raw materials as coal, air, and water.

This exhibit of "Better Things for Better Living through Chemistry" will continue during May and June, to emphasize to the public the importance of chemical research in everyday life.

Leeds & Northrup Co., Inc., 4901 Stenton Ave., Philadelphia, Pa., has opened a new branch at 1415 Lincoln Bldg., 60 E. 42nd St., New York, N. Y.



One of the Executive Offices of Continental Carbon Co.

Continental Carbon Opens New Offices

Because of an increasing demand for carbon black, Continental Carbon Co., formerly Witco Carbon Co., has just completed a new plant at Sunray, Tex., and has opened executive offices at 295 Madison Ave., New York, N. Y. New uses are continually being found for carbon black because of its reenforcing, wear-resisting, and color-tinting properties.

Examination of reported production figures discloses how rapidly this new product is assuming a place of vital importance. In 1933, 273,125,000 pounds of carbon black were produced; 352,749,000 pounds in 1935; over 400,000,000 pounds in 1936; and indications are that 1937 will be considerably ahead of 1936. Reserve stocks are now reported to be the lowest on record. Actual conditions appear to have verified the conclusions of executives of Continental Carbon Co. late in 1936 when they decided that increased production capacity would be required to meet the demand. The new modern plant is now in operation and is expected to be producing 3,000,000 pounds of carbon black per month not later than June first.

Continental Carbon has appointed Don M. Welch, of Akron, O., as rubber chemist in the laboratories of its plant at Sunray. Mr. Welch is a graduate of chemistry at Ashland College. After graduation he was for four years assistant to the chief chemist of the Mansfield Rubber Tire Co., Mansfield, O., where he engaged in material and product testing and in tire compounding. For the past six years he has had extensive experience in the development of mechanical goods for the Bearfoot Sole Co., Barberton, O.

Vulcanized Rubber Co., Morrisville, Pa., continues to operate normally. Treasurer Hugh A. Ross has been on a pleasure trip to Florida and Bermuda.

U. S. Rubber News

United States Rubber Co., 1790 Broadway, New York, N. Y., at its annual meeting on April 20 at Jersey City, N. J., elected the following new directors when the board was increased from 12 to 15 members: Samuel B. Howard, William M. Stevens, Samuel C. Wood.

U. S. Rubber has taken out a building permit for the erection of a nine-car garage and storehouse of steel and concrete at its plant in Valley St., Providence, R. I. The cost is estimated at approximately $10,000.

The company recently made a pair of boots, size 32, for eight-foot seven-inch Robert Wadlow, the young giant of the Ringling circus.

The following is a reprint of a notice of proper practice as recently received from United States Rubber Products, Inc.

The word "Lastex" is a registered trade mark, No. 286,680, applied to an elastic yarn manufactured exclusively by United States Rubber Products, Inc., 1790 Broadway, New York, N. Y. The yarn is also protected by Patent No. 1,822,847 and other patents controlled by that corporation. Adamson Brothers Co., Inc., 1790 Broadway, New York, N. Y., is the sole distributor of "Lastex" yarns for United States Rubber Products, Inc. The word "Lastex" is subject to the usual laws and regulations governing the use of trade marks. Therefore, it is not a generic term like silk or rayon. It should never be used as an adjective or as a descriptive term applied to a garment, a material or a process. It should always appear with an initial capital and be enclosed within quotation marks, thus, "Lastex". When the word "Lastex" is displayed in advertising matter, the phrase "Reg. U. S. Pat. Off." should appear in small type under the "Lastex" or spotted by means of an asterisk in some other portion of the copy.

Examples of Correct Usage: Blank's foundations, made with "Lastex" yarn—Material containing "Lastex" yarn—Swim suit incorporating "Lastex" yarn—Shoes with gores of "Lastex" yarn.

Examples of Incorrect Usage: Blank's "Lastex" foundations—lastex—Lastex—"Lastex" shoes—"Lastex" effect—Lastex lace—"Lastex," embroidered—"Lastex feature."

U. S. Rubber Products has leased the building at Second Ave. North and Fourth St., Minneapolis, Minn., to be remodeled at a cost of $10,000 for its Minneapolis and Northwest branch. The building, seven floors and basement, is 125 by 150 feet, with 150,000 square feet of floor space. It is one of the best built wholesale structures in Minneapolis, with heavy foundations and massive walls. It contains a complete sprinkler system for fire protection. The company took possession in mid-April.

Rosser A. Donley, of U. S. Rubber Products, Naugatuck, Conn., recently arranged a demonstration of how rubber shoes are manufactured for children of a local school.

On April 13 the company's footwear plant at Naugatuck entertained the 407 March Quality Winners at "Jamboree" night at which Mr. Donley acted as master of ceremonies. Ninety-seven of the Factory Council, Supervisory, and Foremen staff served on the various game committees, and music was furnished by an orchestra composed entirely of employes.

The minute the sales promotion men of U. S. Tire Dealers Mutual Corp. discovered it takes more engineering to

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F. B. Davis, Jr., U. S. Rubber President, Greets Bowlers from the Firm's Tire Plant in Indianapolis on Their Arrival in New York to Compete in the A.B.C. Tournament

OHIO

IN OHIO resumption of automobile assemblies following strike settlements caused a spurt in production of some parts plants. Machine tool and foundry equipment sales also have been holding up, the latter being more than twice as large as a year ago. Manufacturers of machinery for the rubber industry also report excellent business, with orders unable to be filled for at least sixteen weeks.

In certain lines advancing prices stimulated buying to some extent, but generally improved business was responsible for a greater share of the gain.

The rubber goods industry, according to one authority, is expected to go forward from its current strongest position in seven years and establish new high records during 1937.

During the first quarter demand was unabated for tires, mechanical goods, and druggists' sundries, and floods gave a spurt to sales for footwear. These gains were extended from the upward movement in 1936, which carried crude rubber consumption to a new high for the second successive year and reduced world stocks abruptly; while production of automobile tires was up 17.7% from 1935, exceeding previous annual totals since the 1929 record high. Manufacture of mechanicals has assumed growing importance in the rubber industry. Labor conflicts again are confusing the outlook. Costs of production have increased so rapidly that retail prices have yet to reflect these fully despite the several advances made. In fact one tire manufacturer believes another price increase imminent; while another manufacturer foresees inflation. In nearly all divisions manufacturers of rubber products were on higher schedules this year than during the first quarter of 1936; operations for the entire industry being around 90% of theoretical capacity. Production ranged from 15 to 25% larger, with the smallest increase in the footwear division, where carry-overs were heavy.

Stalwart Rubber Co., Maple Heights, recently purchased as an investment and possible future occupancy part of the McMyler Interstate plant at Bedford, including an all-steel building one story high with floor space of 40,000 square feet and four acres of land, according to Herman Osborn, Stalwart president. The rubber concern, which has fifty employes, manufactures mechanical rubber goods to factory specification.

Columbia Alkali Corp., 30 Rockefeller Plaza, New York, N. Y., according to W. I. Galliher, director of sales, will open offices at 3849 Hamilton Ave., Cleveland, O., with A. E. Shaw as district sales manager for the northern Ohio district.

Goodyear News

Three changes in the official family of The Goodyear Tire & Rubber Co., Akron, were made at a meeting of the board of directors March 29. E. J. Thomas, formerly assistant to President P. W. Litchfield, was made executive vice president. P. E. H. Leroy, formerly vice president and treasurer, was made vice president in charge of finance, which places the comptroller's division under his supervision. Z. C. Oseland, formerly assistant treasurer, was made treasurer. Other officers and directors were reelected.

Earlier in the day Mr. Thomas had been elected to the board of directors at the stockholders annual meeting, replacing Newton D. Baker, who retired from the board of directors, but who remains as chief counsel for the company.

Other action of the directors calls for redemption on July 1, 1937, at $110 per share and accrued dividend the shares of $7 Second Preferred stock that remain outstanding. Redemption of these shares, which total less than 2% of the original issue, marks completion of Goodyear's Plan for Rearrangement of Capitalization. Previously, 747,739 shares of the Second Preferred stock (over 98% of the total) has been exchanged for the new $5 convertible preferred stock and common stock under the terms of the plan, the exchange offer having expired March 13, 1937.

The official group of the company now stands as follows: Board of Directors: Messrs. Litchfield, Leroy, Thomas, George T. Bishop, T. M. Girdler, E. B. Greene, H. B. Manton, G. A. Martin, Grayson M. P. Murphy, J. R. Nutt, Robert G. Payne, Robert C. Schaffner, Francis Seiberling, C. Slusser, C. F. Stone, G. A. Tomlinson, and R. S. Wilson.

Executive and Finance Committee: Messrs. Litchfield, Thomas, Leroy, Greene, and Murphy.

Executive Officers: Mr. Litchfield, chairman of the board and president; Mr. Thomas, executive vice president; Mr. Slusser, vice president in charge of production; Mr. Wilson, vice president in charge of sales; Mr. Leroy, vice president in charge of finance; Chas. A. Stillman, vice president; Mr. Oseland, treasurer; W. D. Shilts, secretary; C. H. Brook, comptroller; H. W. Hillman, assistant treasurer; F. R. Wahl and W. M. Mettler, assistant secretaries; C. L. Weber, H. D. Hoskin, and H. J. Young, assistant comptrollers.

In the official factory lineup several changes also were announced. B. Darrow, development manager, at his own request returns to the plant in California to the job he left in 1923, manager of technical services. He replaces J. C. Warden, who returns to Akron. W. S. Wolfe, assistant manager of truck tire sales, is again development manager, the position he held in 1921. Tommy Tomkinson, superintendent of Plant Two, has been named general superintendent, a post vacant two years.

Other changes in plant personnel, announced recently by Vice President Slusser, follow: Ed Sheahan, of Australia, to be superintendent at Jackson, Mich.; Walter Condon, of England, to succeed Mr. Sheahan at Sydney; Tom Clayton, head of the Squadron and Goodyear Hall, to be assistant superintendent at the Michigan plant; L. D. Hochberg, of the Engineering Squadron, to succeed Clayton. Also, with the reopening of the New Bedford, Mass., textile mills, C. W. Young, of Decatur, becomes superintendent with P. D. Ostrander, of the Textile Development Department, Akron, as assistant. W. E. Floyd, assistant at Cartersville, succeeds Mr. Young.

The Jackson plant, it is said, will begin production June 1, two weeks ahead of schedule. Installation of machinery in new and remodeled buildings is being rushed. Two thousand men will be employed when the factory operates at capacity. Other assignments announced to the Jackson plant are: K. L. Reynolds, personnel manager; Roy Ludick, manager development; F. H. Ferguson, division "A"; Ray Jones, passenger tires and tubes; Charley Sowers, truck tires; Paul Haspelmath, master mechanic; N. R. Ball, efficiency manager.

Al Goulding recently was named manager of the Engineering Squadron and the Apprentice School. Since 1931 he had been a foreman of the Engineering Squadron.

Pharis Tire & Rubber Co., Newark, through President Carl Pharis announced the election of a new director, H. N. Mallon.

Fremont Rubber Products Co., Fremont, which was recently organized, will manufacture a variety of rubber products, and production will be increased at once, according to new elected executives of the company. These include Howard M. Potter, president; Paul Kridler, vice president; Robert B. Lucas, secretary; R. D. Hetrick, treasurer; and Ed. Shaw, factory manager. Mr. Shaw for five years was with the Monarch Rubber Co., Hartville, and was at one time superintendent of the Northern Rubber Co., Barberton.

The Oak Rubber Co., Ravenna, manufacturer of toy balloons, last month celebrated the twenty-first anniversary of the founding of the firm by Paul Collette and Jack Shira.

The Falls Rubber Co., Cuyahoga Falls, has entered the repair materials field and is offering a full line of camelback, cement, and other tire shop supplies.

Goodrich Notes

Akron rubber companies are accustomed to getting requests for adjustments on tires, but one recently received from Brian Stack, 7 Mowbray Rd., Edgware, Middlesex, by The B. F. Goodrich Co., was for an adjustment on tires, or "tyres" as the English have it, that have been in service since 1900. The letter follows:

"Dear Sirs: I am in trouble with some of your tyres. They leak gradually and not through the valve. They are rather old, being single tube tyres of 1900 date of manufacture. They are on a Locomobile steam car that I am overhauling for a famous collector in this country, R. O. Shuttleworth of Old Warden Park, Biggleswade, Bedfordshire. He is very keen on using the same tyres on the few runs that are made in this country every year to show how motoring used to be. The size is 28 by 2½ with five lugs.

"Have you any useful ideas on how to treat these internally to cure their porosity? For instance, how about putting a half-pound of thick rubber solution in each tyre?

"The treads are supple and as good as new as far as I can tell, a wonderful tribute to the quality put into them. One out of the four is holding up well after a fortnight. Therefore I am hopeful of restoring the others and preserving in use a world's record that can never be beaten, pneumatics in use after 36 years."

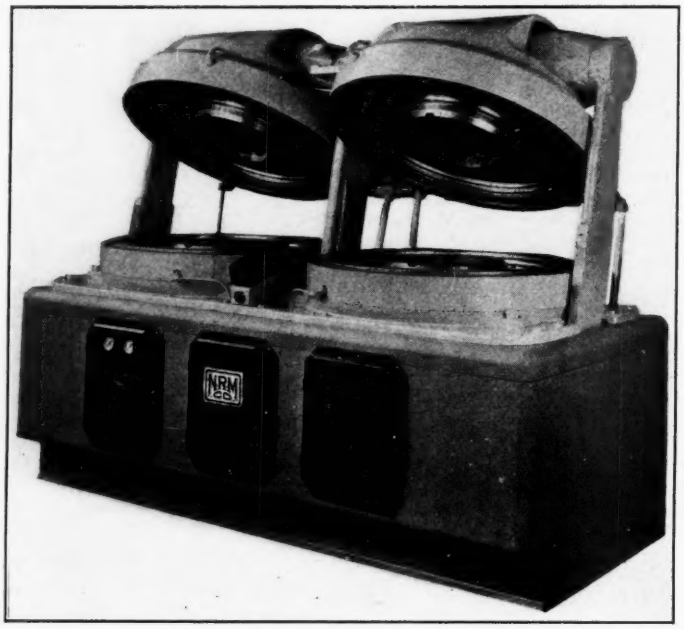
Goodrich sent Mr. Stack a special compound developed by its technical men which, it hopes, will preserve the tires for several more years.

More than 7,400 Goodrich factory employes are entitled to vacations with pay this year, according to the company's 1937 vacation plan. Workers with 10 years' service will receive two weeks' vacation and vacation pay amounting to 40% of the individual's total earnings in 1936. Factory hands with five years' service will take a weeks' vacation with 2% of their 1936 wages for vacation pay. This vacation program will begin immediately and will extend to October 1 owing to the large number of employes entitled to vacation privileges.

Eighty-five Goodrich dealers on April 8 participated in a meeting followed by a luncheon at the Hotel Hildebrecht, Trenton, N. J., at which motion pictures were shown. Talks were given by George Sturtevant, Philadelphia district manager, and J. T. Rider, district sales manager. H. L. Dengler, Trenton wholesale manager, presided.

National Machinery Gets Huge Ford Order

The National Rubber Machinery Co., Akron, O., recently received from the Ford Motor Co., Detroit, Mich., what is believed to be the largest single contract for tire building equipment ever placed. The order calls for 300 new-type dual automatic tire vulcanizers, with molds, 74 new-type automatic inner tube vulcanizers, and a number of extruding machines of 2½-, 6- and 8-inch sizes. Delivery of the equipment is scheduled to begin on June 15 and is to be completed in 100 working days.



National Dual Tire Press

The equipment is to be installed in the new tire manufacturing plant now being built by the Ford company at River Rouge, Mich., and it is estimated that when all the tire building machinery is in operation, the plant will have a capacity of 18,000 tires per day. Operations are expected to begin late in August.

The tire and tube vulcanizers are of the latest type, being fully automatic in operation and embodying many new and advanced features, a number of which have been suggested by Ford engineers to meet Ford standards in the plant. These units include an improved type of toggle mechanism, simplified piping which practically eliminates the use of the conventional type of swing joints.

The dual tire unit consists of two separate mold units, combined on one base and operated by a single motor drive and gear reduction, and is a decided improvement over previous presses, or vulcanizers, for tire vulcanizing, owing to the fact that all previous models have been designed for single operation, having an individual drive for each single unit. Also, because of the compactness of this unit, a considerable amount of floor space is saved. The side members are designed in such a manner that the presses can be placed approximately ¼-inch apart, giving the battery of vulcanizers the appearance of a continuous machine.

The inner tube vulcanizers are to be of a new type designed along the same general lines as the dual tire vulcanizers, except that they are single units.

Annual Meeting

National Rubber Machinery Co. held its annual stockholders meeting in Akron on April 5 when a report on the business of the company showed a marked improvement during the year. The following officers were elected: Nils Florman, president; R. R. Hoskins, treasurer; S. A. Fraine, vice president in charge of plants and production; and J. R. Stricklen, vice president in charge of sales.

Legal

(*Continued from page 65*)

stretching machine; 1,507,563, A. O. Abbott, Jr., Method and apparatus for manufacturing tire casings, D. C., N. D. Ohio, E. Div. Doc. E 3675, *U. S. Rubber Co.* v. *The Goodyear Tire & Rubber Co.* Dismissed without prejudice Nov. 6, 1936.

1,374,505 (*b*), E. Hopkinson, Method of making motor vehicle tires; Re. 17,618 (of 1,713,658), same, Manufacture of tire casings; 1,607,266, H. V. Lough, Rubberized fabric and its method of manufacture; 1,372,567, T. Sloper, Method of manufacturing the covers of pneumatic tires; 1,487,033, same, Apparatus for making the covers of pneumatic tires, D. C., N. D. Ohio, E. Div., Doc. E 4084, *U. S. Rubber Co.* v. *The Goodyear Tire & Rubber Co.* Dismissed without prejudice Nov. 6, 1936.

"Indicating Thermometer Catalog." Consolidated Ashcroft Hancock Co., Bridgeport, Conn. A 45-page catalog describes various types and sizes of indicating thermometers with special fittings.

NEW ENGLAND

MANUFACTURING activity in New England continues on a high plane; yet trade was under expectations. The textile industry is enjoying very good business; while the shoe trade is more active than is customary at this season although scattered labor troubles are reported. Adverse weather conditions last month were an unfavorable factor.

Universal Winding Co. will move its general offices from Boston, Mass., to its plant on Elmwood Ave., Cranston, R. I., about June 1, according to a statement by Treasurer Parkman D. Howe. President Robert A. Leeson will continue to maintain his personal headquarters at Boston. The company has started an addition and alterations to the plant. The addition will be of brick and cement construction, and the entire project will involve an outlay of approximately $12,000.

The American Wringer Co., Woonsocket, R. I., recently settled the strike in progress since February 18 and affecting more than 600 workers when it granted a 10% wage increase. The strikers originally had demanded 20%. George R. Keltie is general manager of the concern.

Charles E. Speaks, president, The Fisk Rubber Corp., Chicopee Falls, Mass., recently returned from an extended business trip through the West and the South. Colonel Speaks reports he was very much encouraged to see an improvement in the dealers' mental attitude. They are looking forward; they are talking and planning to do better business; they are talking about profits and not losses. The Fisk company head is encouraged to believe that dealers and manufacturers are going to find a way of solving their difficult problems and that they can go forward from here on a sound basis.

First Pneumatic Tires

In August, 1894, Charles E. Duryea, builder of America's first successful automobile was building his third horseless carriage at Springfield, Mass. The two previous models had been equipped with solid tires, and Mr. Duryea sensed the necessity of pneumatics, but there was no such thing as pneumatics. He went to the Hartford Rubber Works in Hartford, Conn., later a part of United States Rubber Co., and asked the firm to build a set of pneumatic tires to fit his 44-inch diameter front wheels and 48-inch rear wheels. Accordingly a set of single tube pneumatics with two-inch cross section was furnished in 1894 and installed in March, 1895.

Mr. Duryea entered this car in the first motor vehicle contest ever held in America, which was the renowned *Chicago-Times Herald* race from Chicago to Evanston, Ill., and back, a distance of approximately 50 miles, which race he won on Thanksgiving day, 1895. More than 60 cars were entered, but only six were able to start, Duryea, two electrics, and three foreign makes. A blizzard occurred on the day of the race, and the course was covered with snow and ice 12 inches deep. Mr. Duryea won the race in 7½ hours to collect a $2,000 prize. The only other car to finish was one of the three foreign makes.

A letter written by George Henry Hewitt, president of Duryea Motor Wagon Co., to the Hartford Rubber Works on December 23, 1895, related that after the car had been shipped to Chicago, someone drove a knife through one of the tires to see whether or not it was solid. The cut was bored out with a hot poker, a plug was put in with a couple of tablespoonfuls of cement, and the tire blown up, the time for making the repair being about ten minutes. The car was placed on a testing machine and tested until midnight. The next day it won the race.

Mr. Duryea's first car, weighing 700 pounds and powered with a four cylinder engine was started in August, 1891, and completed in April, 1892. The third car, finished in the winter of 1894-1895, is shown in the accompanying picture with Mr. Duryea at the wheel. This car had throttle control, spray carburetor, advanced spark ignition, ball bearings, artillery wheels, inclined king pins, bevel gear differential, gear transmission with three speeds forward and reverse, multi-cylinder motor water cooled with pump circulation, external contracting band brake, pneumatic tires, and other features well known in today's cars.

At a celebration in Springfield, Mass., on April 14, 1937, for the purpose of honoring Mr. Duryea for his achievements as an automobile builder he also was rewarded for his contribution to the tire industry by a special award presented by a representative of the company which built the first pneumatic tires for his car.

Duryea and the Original Pneumatic Tires

Godfrey L. Cabot, Inc., Boston, Mass., has reported that plant expansion for its fiscal year ending September 30, 1937, will exceed $4,000,000. This includes natural gas pipe lines from northern Pennsylvania gas fields to Rochester, N. Y., completed in January; addition to the carbon black plant at Stinnett, Tex., completed in March; new carbon black plants at Wickett and Kermit, Tex.; and a new natural gasoline plant in the Keystone oil field near Kermit. Carbon black producing capacity will be increased about 30% to keep step with expanding sales of Spheron, the dustless form of black made under the company's exclusive patents. The new carbon black plants at Wickett and Kermit will be especially designed for convenience in making bulk shipments. Cabot recently ordered twenty new cars to handle Spheron in bulk.

The Converse Rubber Co., Malden, Mass., early last month closed its factory one week for annual inventory and to allow for repairs. The plant now hires about 1,100 workers, having reduced the number from 1,500 because unseasonable weather conditions in the East reduced the demand for rubber footwear.

Harvey Tire & Rubber Co., a retreading concern at 875 Massachusetts Ave., Boston, Mass., of which Harvey Bauxman is owner, suffered a loss of more than $20,000 on April 5 when an explosion followed by a five-hour fire damaged the plant.

(*Continued on page* 82)

NEW JERSEY

NEW JERSEY manufacturers, effective April 1, announced an increase in prices of from 5 to 10%. Wages were voluntarily advanced at most of the plants, the increase also ranging from 5 to 10%. Business is reported generally good, and manufacturers believe it will remain so even though labor conditions are somewhat unsettled and important court decisions are pending. Only a few concerns reported declining business the past month.

Jos. Stokes Rubber Co., Trenton, tied up by a short strike of its 700 employes, is running again, but reports that business dropped off somewhat. Officials believe this decline was due to the labor trouble. When the employes quit work, they remained in the yard of the plant until the strike was settled. Milton H. Martindell, vice president and secretary-treasurer, declared that the strikers demanded a 50% increase; yet they agreed to call the strike off when given a 15% raise. The plant operates 40 hours a week.

Essex Rubber Co., Trenton, is receiving increased orders for heels and soles, with conditions generally good. Lloyd Case, Essex treasurer, was on a trip through the New England shoe districts, including North Adams, Boston, and Brockton.

Lambertville Rubber Co., Lambertville, manufacturer of rubber footwear, closed because of lack of orders. John T. Crowley, president, said he believed the shut-down would be for a short time only. He stated that the mild winter had not been favorable to the footwear business. Several hundred employes are affected by the closing of the plant, one of the oldest of its kind in this section. Three Massachusetts creditors of the rubber company filed a petition in the United States District Court at Trenton for a reorganization under Section 77B of the Bankruptcy Act of the Lambertville concern. The petitioners are United Shoe Machinery Corp., Lynn Specialty Co., and Bird & Sons, Inc. It is claimed that the company's present income is not sufficient to meet operating charges.

The American Hard Rubber Co., Butler, has signed a new yearly wage agreement with the United Rubber Workers' Union, which provides increases ranging from 3 to 8% for the 700 employes. The new minimum hourly rate for men is 54¢ and 37¢ for women. Increases are on a sliding scale with employes in the lower bracket receiving an 8% raise and those in the higher levels 3%.

Acme Rubber Co., Trenton, announces that production this year was far greater than during last season. The plant has not been affected by any labor disturbances.

Dural Rubber Co., Flemington, closed for some time, is now on the market. It was hoped for a while that the plant would be running again.

Pocono Rubber Co., Trenton, reports that the plant is operating to capacity with good prospects ahead.

Whitehead Bros. Rubber Co., Trenton, is operating with three shifts. The company increased prices 10% April 1.

Pierce-Roberts Rubber Co., Trenton, is now running with three shifts with many orders on hand. Officials announced a 5% wage increase effective April 1.

Puritan Rubber Co., Trenton, reports a general pickup in business and is again operating with a day and a night shift. The firm has let a contract for a brick factory addition to cost $5,000.

Raybestos-Manhattan, Inc., Passaic, held an annual meeting April 6 at which President Sumner Simpson reported good business with prospects favorable for its continuance. The company decided to increase the number of its directors from 12 to 15; so the following were elected to the board: Vice President J. H. Merrell, Sales Manager Robert Davis, and Robert Abbott, manager of the Canadian division.

The Newark Wire Cloth Co., Newark, N. J., prominent manufacturer of high-grade woven wire screens and wire cloth products, has appointed J. K. Porter Co., Union Trust Bldg., Pittsburgh, Pa., as its agent to cover the western Pennsylvania territory.

Metalastic Mfg. Corp., Hackensack, N. J., recently purchased a mill at 44 Godwin Ave., Midland Park, N. J., where alterations are being made so that Metalastic can move its present company in about May 1. The firm is engaged in manufacturing valve stem packing of a semi-metallic nature, and business warrants a great increase in equipment and manufacturing space. The concern intends to enlarge its line to include numerous rubber articles of a similar nature as valve seat disks, pump washers, etc. A complete modern laboratory is being installed in which Metalastic will develop new products, using not only rubber but synthetic resins, etc. Executives of the company follow: Walter Rautenstrauch, chairman of the board; John S. Burke, president; John C. Chenery, vice president; Gordon V. B. King, treasurer; George V. Leistensnider, secretary and chief chemist.

Plant Rubber & Asbestos Co., Chestnut Dr., Redwood City, Calif., will construct an addition to its plant on Harbor Rd., Redwood City. The cost is estimated at $30,000 excluding equipment.

MIDWEST

BUSINESS in the Midwest varies in different localities. Trade continues to lag in the Kansas City and St. Louis districts, where unfavorable weather has delayed farm work. The industrial situation in the St. Louis territory is marred by strikes, and several large plants have had their output greatly reduced or entirely eliminated by labor disturbances. Small industries, however, are operating on good schedules. In the northern section conditions are spotty. Automobile sales were better last month than in March; and steel output remains at high levels. Automobile production has accelerated as a result of settlement of industrial disputes in domestic plants.

Wishnick-Tumpeer, Inc., 295 Madison Ave., New York, N. Y., manufacturer and importer of chemicals, oils, and pigments, because of rapidly expanding business has found it necessary to move its Chicago, Ill., office to larger and more convenient quarters in the Tribune Tower in the Loop. Founded in Chicago in 1920 as a distributer of chemicals, "Witco" is today one of the country's leading sources of raw materials for the paint, rubber, printing ink, and other industries, with offices now in New York, Cleveland, Boston and London. The Chicago office has kept pace with the rapid expansion of the company's activities and with its larger accommodations, increased facilities, and more convenient location is prepared to give better, more comprehensive service than ever before in its history.

The National Association of Waste Material Dealers, Inc., Times Bldg., New York, N. Y., held its twenty-fourth annual convention at the Hotel Sherman, Chicago, Ill., March 15, 16, and 17. Officers elected for this year are Joseph Schapiro, president and chairman of the board of directors; J. V. Spachner, first vice president; Harry S. Goldstein, second vice president; E. J. Keller, third vice president; and Chas. M. Haskins, secretary-treasurer. Nat E. Berzen was elected president of the Scrap Rubber Institute.

The association has submitted to the Interstate Commerce Commission a formal petition asking that the proposed freight increases effective on scrap rubber as of April 20 be suspended and a hearing granted in connection therewith. The Rubber Reclaimers Association has taken similar action. The increases provide that rates on scrap rubber be increased from Column 20 to 22½, the effect of which would be to increase scrap rubber rates from 12½ to 15%.

HAVE YOU ORDERED YOUR COPIES OF "Compounding Ingredients for Rubber" and "Annals of Rubber"?

Rubber Industry in Europe

GREAT BRITAIN

Velmoda and Firmoda

Although leather continues to be the preferred material for upholstering automobiles in this country, fabrics are claiming more attention. Recently a new product, sold as Velmoda, was put on the market by T. F. Firth & Sons, London. This material, made of short thick mohair velvet pile set into a rubber base, comes in a variety of colors, all guaranteed to be fast. The rubber backing prevents dirt and moisture from penetrating to the cushion; surface dust is easily removed by brushing or with a vacuum cleaner. If an extra-thorough cleaning is desired, the material can be safely washed with soap and water. For Velmoda it is also claimed that it is cool in summer and warm in winter, does not fray at the edges or sag or pucker, and retains its appearance throughout the life of the car.

The same firm also manufactures Firmoda carpeting, made on the same principle as the Velmoda, that is carpet fibers are set into a base of rubber. This material, too, is available in a number of colors and has advantages similar to those of the upholstery fabric. It seems to be finding increased use for automobiles as well as in the home.

Rubber in Horticulture

The latest addition to the booklets on the use of rubber in agriculture issued by the Rubber Growers' Association is entitled "The Uses of Rubber in Horticulture." Amateurs have from time to time made ingenious use of discarded rubber goods in various ways about the garden, and the present work shows what the manufacturers have devised in the way of rubber specialties for commercial horticulture. Among the items may be mentioned different types of rubber ties for trees. In one style a slotted rubber pad is provided which is attached to the stake by tacks and acts as a cushion between tree and stake. A reenforced rubber belt passing through the slots in the pad serves to hold the tree firmly in place without chafing the bark. Another tie has a rubber cushion strip enclosed in a metal expander. For both ties are claimed freedom from chafing, and constriction. To aid cultivation under glass, special molded rubber fittings have been designed to hold in place the two sheets of glass that go to form the tent-like frames. These fittings grip the glass securely even in stormy weather, yet can be easily adjusted and removed again after use, when the glass sheets are stacked up until needed again.

Notes

The Goodyear Tire & Rubber Co., (Great Britain) Ltd., has opened a new branch at 141-147 Mile End Rd., London.

Goodyear Tire & Rubber Co., Ltd., recently appointed W. H. Binns manager of the commercial tire department.

What is claimed to be the biggest retreading plant in Europe, and perhaps in the world, was recently opened when Tyresoles, Ltd., moved into its new works at Wembly.

Mobile cranes are used for work in hangars and other restricted spaces in R. A. F. Aerodromes. The latest two-ton cranes of this type supplied by Ransomes & Rapier, Ltd., to the Air Ministry, have the front wheels equipped with pneumatic tires. It seems that the tires not only reduce vibration over bad roads, but enable the cranes to travel on much softer ground than has hitherto been possible. Experiments are now in process to determine whether it would be as advantageous to fit pneumatic tires to the heavier types of cranes also.

Rubber School

The Northern Polytechnic Rubber School is doing excellent work in training youths, especially for development work in rubber factories. Diploma students are capable of carrying out all routine testing, both physical and chemical, and the principal of the school, Dr. T. J. Drakely, stated at a recent meeting of the Advisory Committee in Rubber that the careers of diploma students from Polytechnic indicated that for factory work they were at least as satisfactory and probably better than university graduates. They receive a very intensive training in the practical application of their knowledge to factory processes and technical problems.

The equipment of the school is constantly being added to, and it now possesses the most up-to-date machinery for producing tires. A new latex physical chemical laboratory, to accommodate 60 students, is nearing completion, and it is expected that with proper encouragement from the rubber industry it will develop into a useful center of latex research work besides offering students good training in latex processes.

GERMANY

Leipzig Fair

This year's Leipzig Spring Fair was probably one of the most successful held in years. A comparatively large number of foreigners visited the fair and very satisfactory business was reported. Substantial increases were noted in various lines. The home demand, too, was keen, and several factories are said to be sold out for months ahead.

Because of the restriction in the use of raw materials that have to be imported, rubber manufacturers had to limit the production of novelties and to cut down the assortment available for home consumption. Goods for export, however, showed the same range and quality as before.

As expected, goods of the newer thermoplastics intended to take the place of rubber were largely featured. Like Buna, several of these materials have acetylene as their base. The most important of these is Mipolam, introduced last year for the first time. This is really a series with different qualities, one type having rubber-like characteristics, others those of leather, cork, and celluloid (without the latter's usual inflammability). At the fair was shown Mipolam piping for the chemical, foodstuff, textile, brewing, and distilling industries. These pipes are said to be very strong and to have a very high resistance to alkalis, alcohol, benzine, mineral and vegetable oils, acids, and water.

A synthetic shown for the first time at this fair was Guttasyn, also based on acetylene. As its name implies it has qualities resembling those of gutta percha; it is said to be highly resistant to temperature, aging, and within the necessary limits, resists acids and alkalis. Rost & Co. displayed a variety of hose, packing, and cord made from this new material.

Buna, of course, was represented in various forms on a number of stands. Flugel & Polter showed Buna aprons for factory workers; Continental, Buna bonded to metal, and both Continental and Clouth displayed a number of molded parts, various kinds of hose, window channeling, all of Buna, besides printing rolls with Buna covering. The former firm also had rubber goods made of Titanit, a material in the production of which one of the new I.G.Farbenindustrie synthetics, Igelith or Oppanol, is used.

Oppanol was used, too, for the children's panties by Flugel & Polter.

Among the new articles of natural rubber may be mentioned the blue-tinted light-absorbing gloves made of latex and put out by Zieger & Wiegand of Leipzig.

Berlin Auto Show

Owing to the conspicuous absence of tire manufacturers at the International Automobile Exhibition in Berlin in February, very little can be said about the latest developments in German tires. On the other hand, Buna was a feature. In the Hall of Honor two enormous paintings demonstrated the production of synthetic benzine and of synthetic rubber. In front of the latter various automobile parts of Buna and a number of tires with Buna tread were displayed. Among the tires was one produced by Continental, made entirely of German raw materials: Buna, carbon black, cord fabric, as well as artificial silk.

Some of the cars of the Standard concern were equipped with so-called Gripping tires, made by Veith-Werke A.G. These tires have four rows of suction cups of conical form which, it is said, cannot be clogged with dirt, etc.

At the stand of Fleming, "Schleudernie" (Never-skid) tires were exhibited. The treads of these tires have grooves which form an angle of 45 degrees with the track. The grooves on the tires on one axle run in opposite directions so that the extensions of the grooves touching the roadway intersect at the extension of the center of the car. Tests on a street artificially rendered slippery by soap and oil gave convincing proof of the effectiveness of this principle.

To equalize the load on twin tires Continental proposes the insertion of conical rubber rings between base rim and wheel body, by which small angle movements of the wheel are produced, giving the desired result, especially on crowned streets. Rissmann showed a device for automatically equalizing the pressure of twin tires and at the same time inflating both of the tires simultaneously.

Notes

Recently the Buna-Werke G.m.b.H. was established at Merseburg for the manufacture of the synthetic rubber known as Buna. The capital is 30,000,000 marks, all the shares being subscribed by the I.G.Farbenindustrie A.G., Frankfurt, a.M.

On April 1, 1937, Dr. Paul Baumann, chief chemist and manager of the tire division of Continental Gummiwerke A.G., Hannover, celebrated the twenty-fifth anniversary with the firm. As early as 1918, Dr. Baumann experimented with the production of tires from synthetic rubber and that same year actually succeeded in making a tire of 100% synthetic rubber. Today Dr. Baumann is still in the front rank of those contributing to the chemical development of tire construction.

EUROPEAN NOTES

The Syndicat du Caoutchouc has spared no efforts to insure that the rubber industry will be represented as completely as possible at the International Exposition to be held in Paris from May to November of this year. Early in February the first stone was laid of the Rubber Palace, a two-story structure covering about 800 square meters. Here the public will learn of the innumerable uses to which rubber is put; visitors will see the actual process of manufacture of such articles as balls, bathing caps, sandals, carpets, toys, etc., and the interesting scientific processes in connection with the synthesis of rubber, vulcanization by high frequency currents, etc., will also be shown. The Union des Planteurs en Indochine in collaboration with the Rubber Growers' Association and the International Association for Rubber Cultivation in the Netherland Indies will present all the aspects of rubber growing and preparation of rubber on the estates. The floors of the rubber palace will be carpeted with rubber.

In connection with this exhibition an International Rubber Congress will be held from June 28 to 30, 1937; this is organized by the Syndicat du Caoutchouc, the Association Francaise des Ingenieurs du Caoutchouc, the Union des Planteurs de Caoutchouc en Indochine in collaboration with the *Revue Générale du Caoutchouc*. Various papers on the technology of latex and on synthetic rubber and derivatives of rubber will be read; and visits to laboratories and factories have been planned.

The well-known Spanish firm of Rocaguix, Barcelona, Spain, informs us that despite the present conditions in Spain, production is going on as usual. In fact this concern, which specializes in rubber machinery, has recently put out an improved hydraulic press for footwear that is claimed to have several advantages. The new press is electrically heated and, while consuming a minimum of power, puts out 250 pairs of sandals in eight hours. It is said that heat is distributed with a regularity never attained before with this class of machinery and, furthermore, that the highest temperatures can be reached without the least effort.

The A.S.Nordiske Kabel og Traadfabriker, Copenhagen, Denmark, reports profits of 4,300;000 kroner for 1936 against 3,440,000 kroner the year before. A 12% dividend was again declared.

Societe Pirelli of Milan, Italy, which has a capital of 200,000,000 lire, closed its past business year with a profit of 32,820,000 lire. Out of this a dividend of 12% was paid as in the preceding year, 1,640,000 lire went into general reserves, 6,390,000 lire into special reserves, and 460,000 lire were carried forward. Pirelli & Co., also of Milan reported profits of 3,120,000 lire on a capital of 24,000,000 lire. It too paid a 12% dividend.

EASTERN

(*Continued from page 68*)

build a U. S. truck tire than it did to build the Brooklyn Bridge, they knew there must be scores of other hidden facts, equally interesting, in the development, construction, and performance of their truck tires. So, with the aid of Robert L. Ripley, world renowned specialist in uncovering the unusual and unbelievable, they dug up a whole series. From this information they fashioned the 1937 Direct Mail Truck Tire Campaign. Orders from dealers have been eight times greater than corresponding orders last year.

With its campaign planned to break in New York the latter part of April, U. S. Tire Dealers Mutual Corp. will use space in approximately 600 newspapers covering all major markets this year. Cooperative newspaper advertising will be run concurrently, as will a national magazine campaign and publicity in farm paper and trade publications.

A new sales district has been established by U. S. Tire Dealers Mutual Corp., at 607 W. Fifth St., Charlotte, N. C., with W. J. Palmer, former salesman in the Raleigh organization, as manager. The Charlotte district includes all of South Carolina and that part of North Carolina which is naturally tributary to this important southern distributing center.

Wishnick-Tumpeer, Inc., 295 Madison Ave., New York, N. Y., has appointed George T. Short to its New York office sales department. Mr. Short comes to Witco with wide experience as a chemist, executive, and salesman. A 1917 graduate of the University of Vermont, where he completed the four-year course in three years with a B.S. in chemistry, his first job was in the laboratory and plant of the Armour Fertilizer Works at Chrome, N. J. During the war he did research work on airplane dopes and plasticizers for the United States Government. Following this he was a chemist in the control laboratory of the Calco Chemical Co. In 1920 Mr. Short became assistant to the general manager of the Wilckes, Martin, Wilckes Co., Chemical Division; in 1925 the general manager; the following year a director and vice president of the Wilckes company. He continued on as vice president until the firm was merged with the Swann Corp. in 1930 and then held the same position until the latter organization became a part of the Monsanto Co., St. Louis, Mo., in 1936.

Revertex Corp. of America, 80 Broad St., New York, N. Y., together with Revertex sales agencies in other parts of the world will exhibit textiles processed with Revertex, molded goods, and other products which use Revertex in their manufacture, at Stand S.15 in the Palais du Caoutchouc, Cours la Reine, at the Paris International Exhibition during the Summer of 1937.

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Rubber Industry in Far East

NETHERLAND INDIA

Export Figures

Preliminary figures for rubber exports show that Java and Madura shipped 5,786,220 kilos in February, 1937, against 5,262,823 in January, 1937. Estates in the Outer Provinces shipped 9,773,596 against 9,317,752 kilos, and natives, 11,825,969 against 13,134,782 kilos, in all 27,385,785 against 27,715,357 kilos.

The figures for both January and February are below quota; for estate rubber the total shortage over the two months comes to roughly 10,000,000 kilos and for native rubber 6,700,000 kilos. It is rumored that actually estates produced more than their quota, even though exports were short. In view of this fact and the disturbing effect of the shortage on the market, the government is said to be preparing measures to limit the period during which licenses for both estate and native rubber are valid. Earlier reports stated that the government intended to cancel estate licences issued for the first half of 1937 if they were not used by the middle of the year.

Rubber Shortage Scare

Discussing the talk of a rubber shortage, Mr. Hart, director of the Economics Department, stated in an interview for a local paper that while speculation, rumor, and ignorance try to foster the impression that a rubber shortage is imminent, reliable statistics indicate that for the next five or six years at least there can be no question of a shortage of rubber.

As to the reports that Malaya and Netherland India are unable to produce their quotas, they may be gainsaid by the facts that right now Java is in a position to produce 100% and even more, while estates in Sumatra will be able to do so within a few months and the natives, in the near future.

It is to be noted that Mr. Hart speaks only for Netherland India. In this connection we may say that whereas the Dutch are convinced that whatever individual productive capacity may be (there are estates which admit that they would have difficulty in filling quota), Dutch territory as a whole will have no trouble in producing its quota, and they make no secret of the fact that they regard Malaya's ability to produce her quota with a good deal of scepticism because they consider Malaya's potential output overrated.

At present there are various reasons why Netherland India exports are below quota. As far as Sumatra is concerned, the chief obstacle is labor. This island is comparatively sparsely populated and obtains much of its labor from Java. During the depression it is calculated that no fewer than 200,000 Javanese coolies returned to their homeland. The sudden demand for ready rubber which developed toward the end of last year brought the estates face to face with the problem of rapidly filling up their depleted ranks of labor. Recruiting now is in full swing; about 1,000 coolies per week arrive in Sumatra. But until the full complement has arrived and is broken in to estate work, some time must necessarily elapse. At the same time it must not be overlooked that other crops like palm oil, tobacco, coffee, etc., are also more active and demanding more labor.

As to the natives, a very large number of the gardens have been practically abandoned, in some cases for several years, and before tapping can be resumed they must be cleared. Also the change over to individual restriction, although it has on the whole proceeded smoothly, has caused delay. Finally here too there is shortage of labor to contend with in certain districts. However once the natives get into their stride again, which will probably not be long if the favorable prices continue, they will not fall behind in the matter of production.

Native Rubber under Individual Restriction

Resident van Brakel, head of native rubber restriction, has been making inspection tours in Sumatra and Borneo to get first impressions of the working of individual restriction for native producers.

Palembang, on the whole, made a very favorable impression; distribution of licences went smoothly so that exportation soon proceeded satisfactorily. The authorities' method of dealing with wet and dry rubber is leading to further improvement of the local product. Now when rubber with a moisture content of 10% is offered for export, the officials require licences as for 100% dry rubber so that in this case the natives lose 10%. Rather than suffer this loss, the natives have been buying mangles at such a rate that stocks have been sold out, and new supplies had to be ordered. Natives are also showing greater interest in the erection of small smoke houses so that before long there will be numbers of small smoke houses in the interior in addition to the central smoking houses in the capital which buy up wet sheet. It is therefore expected that before long Palembang will be putting out a perfectly marketable product that needs no further treatment. Reports from the interior indicate that tapping is satisfactory and that numbers of "dormant areas" are now waking up again.

In Djambi, too, the distribution of licences has proceeded without a hitch. But local growers are at some disadvantage owing to a shortage of labor. In fact it was at first feared that this would prevent Djambi from filling its relatively high quota. However the enterprising Menangkabos have been arriving so that the labor difficulty will soon be overcome. Incidentally, the roads that have recently been laid down or improved and paid for out of revenue from the special export duty on native rubber, have been factors in facilitating the influx of Menangkabo labor. In Djambi the cost of living is rising steeply for all sections of the population, even ordinary bazaar goods sharing in the upturn of prices.

Because the officers in charge of restriction arrived in Indragiri later than in the other provinces, some delay occurred in the distribution of licences. This, together with the fact that the district suffers from lack of capital and labor, is responsible for Indragiri being behind in production. But Menangkabos are arriving here in large numbers so that the situation will no doubt soon improve.

Of southern and eastern Borneo Mr. van Brakel's report states that exports were definitely unsatisfactory during the first two months of the year. This condition was largely due to the great number of rainy days and the division of labor to the paddy fields. Nevertheless, much of the "dormant acreage" has been cleared and brought into tapping, and in various districts output is beginning to increase rapidly.

Dr. Hoven, head of the Division of Administrative Affairs of the Outer Provinces, visited Western Borneo and stated that the income of the population was due to undergo a very favorable change as a result of individual restriction, although the cost of living has increased and for the smaller incomes is as much as 25%. Speaking of the works undertaken with the money allotted from the revenue of the special export duty on native rubber, Dr. Hoven mentioned the fine automobile roads that have been completed already and others still in the course of construction, which will help to open up and develop the interior of this rich but still little-known island.

MALAYA

Jan Bata, of the well-known Czechoslovakian firm, has been visiting the Far East, presumably to decide about establishing a footwear factory in Singapore or Java. At a meeting of the Singapore Rotarians, Mr. Bata discussed synthetic rubber and created a sensation when he stated it would be possible for manufacturers to produce synthetic rubber at half the price of the natural product even if the price of the latter decreased, once the factories had been written off. He warned that synthetic rubber production in Central Europe and Russia constituted a real menace to Malayan rubber and suggested that synthetic industries might be protected by the imposition of heavy duties on imported raw materials.

Of course it is realized that as a manufacturer what Mr. Bata says is more or less colored by his own desires. Nevertheless there is a tendency among some planters to take his words seriously, especially those who have viewed the steadily rising prices with anxiety and have been urging that the International Rubber Regulation Committee lift their ban on new planting.

The subject of new planting has been aired frequently of late in the local press, and it has been pointed out, quite rightly too, that it is wiser and cheaper to plant on virgin soil than to cut out old rubber and replant the more or less exhausted areas with expensive buddings. Another logical point is that if—as many contend—Malayan producers would have difficulty in producing more than 80% of quota, the shortage would be accentuated by cutting out the old rubber, as it takes at least 7 years before the new plants can be advantageously tapped. Actually comparatively little old rubber has so far been replanted here since restriction has been introduced. Under the provisions of the scheme the area that may be replanted is about 400,000 acres, but Malayan producers have up to now replanted only 20,000 acres.

If it is true, as has been asserted by various planters, that there is considerable deterioration of old rubber areas and if this is due to deficiencies of the soil as well as wrong methods of tapping, then it would be a piece of wasteful folly to encourage the replanting of these areas with high-grade material, if good virgin land is available, to say nothing of the possibility that good material planted on worn-out soil might prove to be very disappointing.

Continued complaints from consignees of rubber about shortages in shipments which could not have been due to shrinkage alone have led to the consideration of new and more drastic measures to combat the evil. A bill, to be known as the Rubber Supervision Enactment, 1937 (if passed), is to be introduced in the Federal Council in June. It requires all packers to have a license, permits only persons of repute and of sufficient financial standing to pack rubber, and finally provides that packers must deposit $1,000 cash with the treasurer. This deposit will be refunded after the license has expired, but it can be used to cover any fine imposed under the enactment.

Godowns at Singapore and Penang was reported early in March to be overflowing with rubber waiting to be shipped. Stocks in the ports and with dealers increased from a normal 30,000 tons to 41,500 tons in January and were expected to be about 10,000 tons more by the end of February. This situation, it is explained, has been caused by a shortage of freight space, further aggravated by the American shipping strike. Shipowners, other than American, appear to have made little effort toward easing the situation, evidently waiting for April 1 when freight rates to America, the destination of most of the rubber, were scheduled to be raised 50%.

The Wilkinson Patent Process Rubber Co., Ltd., was able to increase its sales substantially during the past year, but nevertheless reported a net loss of $9,796 (Straits currency). The company has been having an up-hill task of it, but with business improving all around it should make a more encouraging showing soon. The chairman, H. B. Egmont Hake, stated that sales in Malaya had increased about 50%. Business with South Africa continues to expand. A complete tube mill liner is to be installed there and, if successful, will open up a large field for Linatex. The Linatex pump has now been developed to the point where it is claimed to be superior to any other type of rubber pump. An increasing number of manufacturers are finding Linatex satisfactory for mounting machinery to eliminate vibration. The peculiar structure of Linatex blanket is said to make it better than any other material for producing a decorative finish on concrete work and it is also ideal for bonding special dressings and color washes, so that it is expected to develop these uses in the building trade. Recently Linatex pipe liners have been supplied for the two largest power stations to be built in recent years, and though the service is exceptionally severe, Linatex is giving entire satisfaction.

In a list of forward sales published recently in the *Times of Malaya* it was noted that the majority (12 in number) had made contracts covering not only 1937, but all of 1938. In all but one case the price for the latter year was 10d. or a fraction more, and the total amount of rubber involved was nearly 1,500 tons.

The Anglo-Java Rubber Co., Ltd., has bought a new estate in Johore with 2,234 acres of planted rubber, and it holds the option on about 2,000 acres of young rubber. The company just increased its capital to £1,750,000 by the creation of 10,000,000 shares of 1s. each.

JAPAN

Japanese exports of rubber manufactures declined 3.2% in 1936 from 1935 and 11.7% from 1933, but maintained an increase of 2.2% when compared with 1934; the figures for total value are 45,613,000 yen in 1933, 39,393,000 yen in 1934, 41,578,000 yen in 1935, and 40,263,000 yen in 1936, states a report from Commercial Attache Frank S. Williams of Tokyo.

As compared with 1935, 1936 exports show a decline of 12% for rubber footwear, and a decline of 0.3% for tires of all kinds. Rubber toys increased 11%, and rubber hose, belting, caps and hats, football bladders, and soft rubber sundries increased slightly, but exports of erasers, threads and bands, tennis balls, and rubber balls declined somewhat.

Manufactured rubber imports came to 885,000 yen in 1936 against 889,000 yen in 1935. Automobile tires and tubes, once a very important trade to the United States, were only 17,473 pounds against 21,309 pounds the year before.

OBITUARY

(*Continued from page 66*)

Hammond, of which he was president and general manager. In 1921 he also organized The McIlroy Belting Works of Canada, Ltd., Kingsville, Ont., of which he was sole owner, president, treasurer, and general manager. He retired from active business about five years ago.

The deceased was past exalted ruler of the B.P.O.E. in San Francisco, Calif., and a 32nd degree Mason.

Surviving are his wife, one sister, two nieces, and a nephew. Funeral services were conducted March 27. Burial was in Oakwood Cemetery, Chicago.

P. P. Cherry

PETER P. CHERRY, 89, a survivor of the earliest office force of The B. F. Goodrich Co., Akron, O., died April 11 after a full and colorful life that began when at the age of twelve he enlisted as the youngest stage coach mail driver in the United States. A widower, Mr. Cherry is survived by three daughters, four sons, thirteen grandchildren and several great-grandchildren. Funeral services were held April 14. Interment took place in Sharon Center Cemetery.

Editor's Book Table

NEW PUBLICATIONS

"Tire Catalog." United States Tire Dealers' Mutual Corp., 1790 Broadway, New York, N. Y. This 48-page comprehensive full-line catalog was made up to familiarize the dealers with the complete line of tires, tubes, and miscellaneous automobile accessories made by United States Rubber Products, Inc. The products are grouped and arranged to facilitate reference. There are many illustrations and tables of data relating to tires, displays and services as well as outlines of plans for increasing sales.

"Independent." U.S. Tire Dealers Mutual Corp., 1790 Broadway, New York, N. Y. The first issue of "Independent," a new monthly magazine, in the interests of the independent tire merchants of America, is just off the press. Articles on the following subjects feature this issue: "First Meeting of Dealer Advisory Council;" "How Service Makes Sales in an Oil Station;" "How Wilmington Dealer Sells Royal Masters;" "How the Farm Market Was Conquered;" "How Columbus Fumbled the Ball."

"Album of Familiar Belts." United States Rubber Products, Inc., 1790 Broadway, New York, N. Y. This folder contains 25 reproductions of photographs of U. S. transmission belts in actual service. In some instances the belts have been used for many years. The service conditions are discussed on the back of each picture. Some of the pictures show how the belts are made and tested. The pictures were taken by Margaret Bourke-White, chief photographer for *Life*.

"Simplified Analysis Chart to Scientific Distribution and Marketing." George Roosevelt. The Roosevelt Organization, 527 Fifth Ave., New York, N. Y. This chart is the result of 20 years' experience in analyzing the basic factors in marketing. Under each of six basic factors several pertinent questions are asked as a guide to a scientific approach to planning a sales and advertising campaign. This booket is available gratis to responsible executives by writing to The Roosevelt Organization.

"Lift Truck Platforms and Lift Trucks." No. 322. Lewis-Shepard Co., 267 Walnut St., Watertown, Mass. This six-page folder illustrates and describes lift trucks, skid platforms with and without racks which can be made to suit special conditions. Strength and rigidity are particularly emphasized.

"The Activator." Vol. 3, No. 1, February, 1937. New Jersey Zinc Co., 160 Front St., New York, N. Y. It contains a brief preliminary report on the influence of a few zinc oxides on the hot tear test and some photomicrographs showing the actual state of dispersion of pigments in rubber compounds using the Roninger method.

"Some Physical Properties of Isoprene." By Bekkedahl, Wood, and Wojciechowski. Research Paper R.P. 951. Reprint from the *Journal of Research of the National Bureau of Standards*. Vol. 17. Dec., 1936. This paper describes the preparation of Isoprene by cracking Dipentene vapors by means of the "Isoprene Lamp" and its purification. The methods for determination of the following physical properties are described: purity; boiling and freezing points; volume expansivity; density; heat of vaporization; refractive index and molecular refraction. There is also a table comparing the physical data of Isoprene according to earlier investigators and these data obtained by the authors.

"Oxygen Lance." Linde Air Products Co., 205 E. 42nd St., New York, N. Y. This pamphlet describes the use of an oxygen lance alone or with an oxy-acetylene blow pipe for cutting heavy masses of metals, which is particularly adapted to removing frozen shafts from pulleys and gears.

"Wagner Circle." Wagner Electric Corp., St. Louis, Mo. This periodical deals primarily with electric motors and the need of selecting the proper motor for a specific job. There are many pictures showing typical installations including the multispeed motor drive for a two-roll rubber callender.

"Morison's Monthly Review." No. 215. February-March, 1937. H. Morison & Co. This English publication of 58 pages is a monthly review of the industrial and rubber markets for private circulation only and discusses the stock market reactions in England. There are numerous tables of financial data as well as some general statements about the different trades and various firms in those trades. Sixteen of the pages are devoted to rubber, several of which show information pertinent to crude rubber production, exports, and consumption.

"Tips on Cable Uses." General Electric Co., Schenectady, N. Y. Release 2532. This leaflet describes the construction of 20 types of insulated cables and their proper uses.

"Holland Cloths," Arkwright Finishing Co., Providence, R. I. This eight-page folder contains a sample and description of each of three grades of Holland cloth—Eagle, Falcon, and Cardinol.

"Directory of New England Manufacturers—1937-38." Published by Geo. D. Hall, Inc., 665 Boylston Street, Boston, Mass., with the editorial co-operation of the New England Council. Fabricoid 11x8¼x1½ inches. 724 pages Price $15.

The first 15 pages of the directory are devoted to data and comments supplied by the New England Council boosting New England as an industrial center. The main body of the book is divided into four sections: (1) Alphabetical Section in which are listed 17,000 New England Manufacturers together with their principal officers, products, number of employes, capital rating, and location of plants or branch offices; (2) geographic section in which the same concerns as above are classified by state, city, and town; (3) Product Section contains all the products arranged alphabetically with the names and addresses of the manufacturers; (4) Brand Name Section lists the brands and registered trade mark names used by the New England manufacturers.

"Directory of Association Members." Association of Consulting Chemists & Chemical Engineers, Inc., 50 E. 41st St., New York, N. Y. The main part of this 60-page directory is devoted to describing each firm of consultants: organization; personnel, and scope of activities. There are also several indices: (1) an alphabetical list of members as of November 1, 1936, including the names and addresses of the firms with which they are associated; (2) a numerical list of the members' certificate numbers; (3) a geographical list of the members according to states; (4) a functional list showing the fields in which the members are qualified. There are two firms listed as being specially qualified in the rubber field and five who are generally qualified.

"Alemite Controlled Lubrication." Stewart Warner Corp., Chicago, Ill. This 56-page lubrication manual presents the entire range of Alemite's industrial equipment of guns, fittings, etc., including a complete section of hand gun repair parts. It also contains considerable data dealing with the use of proper lubricants and articles about special lubrication problems.

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ALLEGED ABSORPTION OF GASEOUS NITROGEN BY BENZENE SOLUTIONS OF RUBBER AND GUTTA-PERCHA HYDROCARBONS. L. B. Howard and G. E. Hilbert, *J. Amer. Chem. Soc.,* 59, 214-15 (1937).

BOOK REVIEWS

"Gum Elastic." Charles Goodyear. Volumes I and II. Published 1855. Fabrikoid, 8¾ by 6 by 1½ inches, 380 pages. Price 10s. 6d.

This book is the *India Rubber Journal's* facsimile reproduction of Charles Goodyear's "Gum Elastic" originally published in two volumes. The editor's preface gives an excellent account of the existence, location, and condition of the various original copies of "Gum Elastic." It also contains some comments concerning statements made by Goodyear about Hancock and the incidents as recorded by Hancock in his book "Personal Narrative" giving a different view.

The first few chapters in Volume I deal in a general way with the sources and physical characteristics of gum elastic as well as other gums as gutta percha, lac, fir tree gums, etc. They contain also accounts of methods used for collecting and coagulating the latex. There are brief historical accounts of the manufacturing of rubber goods as carried on in Europe and America at that time. Goodyear described in detail his early background and the development of his interest in gum elastic. He traced his course of experimentation to the point of the discovery of the possibility of using heat and sulphur to produce a new kind of gum elastic: namely, vulcanized rubber. A description of twelve characteristics of vulcanized rubber is given.

Chapter X is an attempt to familiarize the public in a general way with the manufacture of gum elastic articles. Goodyear discussed capital, power, machinery, compounding, vulcanization, and finishing operations as molding, weaving cut threads into fabric form, etc. He also outlined the probable pitfalls, their reasons and remedies. The following chapter defines the various gum elastic fabrics and other articles and gives a brief description of how these materials were made.

Volume I indicates a persistent effort to develop a satisfactory gum elastic material. Earlier unsuccessful attempts had caused heavy financial losses to the investors that made business men reluctant to invest further money in this new industry. As a result of this reluctance and the limited funds of his friends as well as his own, Goodyear was often imprisoned for indebtedness during his investigations.

In the final chapter of this volume he discussed his plans for further experimental work and the means whereby he expected to finance that work, mainly by license agreements. He pointed out quite definitely his opinions of the patent laws and how he felt that the inventor was not protected sufficiently, particularly in that the inventor himself must bring about court action against an infringer.

The second half of this book is devoted to Volume II: In this portion of the book are numerous articles listed, with many pictures and in all cases directions for manufacturing.

"Centennial Celebration of the American Patent System. 1836-1936." A report written by the National Committee of the Centennial Celebration. Paper 11x8½x⅜ inches. Printed by United States Government Printing Office, Washington, D. C. This book of 85 pages describes in complete detail the celebration of the one hundredth anniversary of the American Patent Office. The speeches given by the various prominent men traced the development of inventions from the earliest times to the present. The development of the American patent system and its influence on the economic well being of the general public was presented by Thomas Ewing, a former commissioner of patents. Dean Kimball spoke on the influence of the great inventions of the past century on making our modern life the complex structure it is. Another speaker dealt with the tendency of future inventions to be the product of organized group study by professional inventors as opposed to the individual inventors of the past and the possible threats to future invention brought about by over-zealous government interference.

"Research on Parade" showed some of the recent outstanding achievements in science and their probable influence on the future economic and social standards. Considerable space is given to the banquet—a "Patented" Dinner, where the menu was printed with patent numbers instead of the names of the foods. By viewing the menu through a special synthetic glass the names of the foods represented by the patents were visible. During the dinner "Voice of Progress" talked about the 12 most eminent inventors, of which Charles Goodyear was one.

New Publications

(*Continued from page 77*)

"Laboratory Miscroscopes and Accessories." Catalog D 185. Bausch & Lomb, Rochester, N. Y. This 20-page catalog features the H-type laboratory microscope in several models with the various accessories.

"Strip Chart Recording Instrument." General Electric Co., Schenectady, N. Y. A 32-page catalog describes the improved CD-type recording instruments. Some of the outstanding features of these instruments are: the D'Arsonval electrodynamometer, ironvane repulsion and resonant-circuit electric elements; the improved recording mechanism; a writing table and

Patents and Trade Marks

MACHINERY

United States

2,071,506. **Tool for Fasteners.** J. W. Dews, assignor to Scoville Mfg. Co., both of Waterbury, Conn.

2,071,646. **Rubber Printing Plates.** L. Melind, Chicago, Ill.

2,071,716. **Tire Building Mechanism.** G. F. Wikle, Detroit, Mich., assignor to United States Rubber Products, Inc., New York, N. Y., a corporation of Del.

2,071,864. **Collapsible Core.** W. H. Myers, Cuyahoga Falls, assignor to Firestone Tire & Rubber Co., Akron, both in O.

2,072,349. **Mold.** H. N. Wayne, Santa Monica, Calif.

2,072,497. **Vulcanizer.** R. A. E. Dupont, Epernay, France.

2,072,759. **Bottle Capping Machine.** J. A. Liley, St. Louis, Mo.

2,073,291. **Tire Building Drum.** E. G. Templeton, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.

2,073,510. **Tire Spreader.** W. A. Bishman, assignor to Bishman Co., both of Minneapolis, Minn.

2,073,729. **Collapsible Form.** H. C. Bostwick, Coventry Township, assignor to Akron Standard Mold Co., Akron, both in O.

2,074,335. **Electrotype Plates and Shells.** R. L. Kelley, Sr., Chicago, Ill., assignor by mesne assignments, to Vulcan Proofing Co., Inc., a corporation of N. Y.

2,074,485. **Tube Splicer.** G. B. Nichols, assignor to Firestone Tire & Rubber Co., both of Akron, O.

2,074,929. **Attaching Elastic Bands to Garments.** J. E. Martin, assignor to Strutwear Knitting Co., both of Minneapolis, Minn.

Dominion of Canada

364,418. **Wire Vulcanizer.** Canadian General Electric Co., Ltd., Toronto, Ont., assignee of E. W. Forstrom and C. O. Hull, co-inventors, both of Stratford, Conn., U. S. A.

364,549. **Pouch Making Machine.** P. M. Yeates, Toronto, Ont.

364,554. **Machine to Make Mats.** H. M. Pryale and S. C. Clark, co-inventors, both of Pontiac, Mich., U. S. A.

364,593. **Tire Constructing Apparatus.** Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont., assignee of H. Willshaw and F. G. Broadbent, co-inventors, both of Birmingham, England.

364,632. **Bathing Cap Form.** International Latex Processes, Ltd., St. Peter's Port, Channel Islands, assignee of S. I. Strickhouser and E. J. Joss, co-inventors, both of Providence, R. I., U. S. A.

364,757. **Finishing Machine.** Panther Rubber Co., Ltd., Sherbrooke, P. Q., assignee of E. A. Sheehan, Stoughton, Mass., U. S. A.

364,951. **Tubular Rivet.** B. F. Goodrich Co., New York, N. Y., assignee of H. E. Waner, Akron, O., both in the U. S. A.

United Kingdom

453,019. **Fabric Drier.** Wingfoot Corp., Wilmington, Del., U. S. A.

453,083. **Tire Building Machines.** Firestone Tire & Rubber Co., Ltd., Middlesex. (Firestone Tire & Rubber Co., Akron, O., U. S. A.)

453,123. **Lining Pipes.** M. Wilderman, Monaco, France, and P. Wilderman, London.

453,230. **Coating Machines.** L. Kay, Manchester.

453,448. **Device to Mold Hose Pipes.** N. Lawson, Penarth, and Lewis & Taylor, Ltd., Cardiff, both in Wales.

453,649. **Knitting Machine.** Everlastic, Ltd., and H. A. Raynor, Nottingham.

453,831. **Apparatus for Making Films.** G. Frenkel, Surrey.

454,326. **Film Evaporators.** Dunlop Rubber Co., Ltd., London, and A. N. Ward and G. W. Trobridge, Birmingham.

454,469. **Recording Apparatus.** International Latex Processes, Ltd., St. Peter's Port, Channel Islands.

454,563. **Vulcanizer.** General Tire & Rubber Co., Akron, O., U. S. A., assignees of H. T. Kraft.

454,829. **Vulcanizing Apparatus.** Continental Gummi-Werke Akt.-Ges., Hannover, Germany.

454,874. **Device to Make Pile Fabrics.** W. Walker and G. H. Curry, both in Durham.

Germany

642,597. **Continuous Measurer of Linear Thickness.** Deutsche Dunlop Gummi Co. A.G., Hanau, a.M.

643,172. **Flexible Shaft Coupling.** Gebr. Eickhoff Maschinenfabrik & Eisengiesserei, Bochum.

643,249. **Dipping Mold.** Felder & Co., Wuppertal-Cronenberg.

643,250. **Device to Produce Air Cushion Covers.** Atlantic Gummiwerk Aloys Weyers, Koln-Braunsfeld.

PROCESS

United States

2,071,507. **Applying Fasteners to Sheet Material.** J. W. Dews, assignor to Scoville Mfg. Co., both of Waterbury, Conn.

2,071,626. **Leather Substitute.** F. Harris, Sharon, assignor to Plymouth Rubber Co., Inc., Canton, both in Mass.

2,071,725. **Shoes.** E. A. Bickford, Worcester, Mass.

2,072,146. **Abrasive Article.** C. E. Wooddell, F. A. Upper, and C. S. Nelson, assignors, by mesne assignments, to Carborundum Co., all of Niagara Falls, N. Y.

2,072,943. **Transfer Medium.** W. P. Cohoe, assignor by mesne assignments, to Underwood Elliott Fisher Co., both of New York, N. Y.

2,073,209. **Writing Machine Platen.** J. W. Heitman, Seattle, Wash., and J. J. Kelly, Portland, Ore., assignors to Huntington Rubber Mills, Portland, Ore.

2,073,821. **Tire Cords.** J. W. Yaxley, assignor to Drummondville Cotton Co., Ltd., Ltd., both of Montreal, P. Q., Canada.

2,073,895. **Treating Rubber Rolls.** W. L. Kauffman, II, assignor to Lovell Mfg. Co., both of Erie, Pa.

2,073,909. **Attaching Couplings to Hose Ends.** H. D. Stecher, Lakewood, assignor to Weatherhead Co., Cleveland, both in O.

2,073,916. **Recovering Fibers from Textile Materials.** I. V. Wilson, Dayton, O., assignor to Merrimac Chemical Co., Everett, Mass.

2,074,444. **Insoles.** H. Warren, Swampscott, Mass., assignor to United Shoe Machinery Corp., Paterson, N. J.

2,074,494. **Concentrating Latex.** D. F. Twiss, W. Green, and E. W. B. Owen, all of Birmingham, assignors to Dunlop Rubber Co., Ltd., London, all in England.

2,074,993. **Treating Rubber.** R. L. Sibley, Nitro, W. Va., assignor, by mesne assignments, to Monsanto Chemical Co., St. Louis, Mo.

Dominion of Canada

364,452. **Elastic Textile Product.** Cela Holdings S. A., Luxembourg, assignee of Societe des Procedes Ecla, formerly "Le Filastic," Lille, Nord, assignee of Leon Sylvain M. Lejeune, Paris, and E. J. A. Lejeune, La Madeleine-Lez-Lille, co-inventors, all in France.

364,480. **Tennis Ball.** Dunlop Rubber Co., Ltd., London, assignee of E. A. Murphy and G. W. Trobridge, co-inventors, both of Birmingham, all in England.

364,617. **Rubber Manufacture.** Softened Rubber, Ltd., Manchester, assignee of R. M. Ungar, London, E.5, inventor, and P. Schidrowitz, London, W.C.2, assignee of ¼ of the interest, all in England.

364,625. **Fibrous Material Coating Method.** Canadian Industries, Ltd., Montreal, P. Q., assignee of M. J. Vittengl, Brattleboro, Vt., U. S. A.

364,630. **Sealing Compound.** Dewey & Almy Chemical Co. of Canada, Ltd., Farnham, P. Q., assignee of W. I. McGowan, Cambridge, Mass., U. S. A.

364,646. **Rubber Bonded Abrasive Article.** Norton Co., assignee of D. E. Webster, both of Worcester, Mass., U. S. A.

364,952. **Hard Rubber Dust.** International Latex Processes, Ltd., St. Peter's Port, Channel Islands, assignee of F. N. Pickett, London, England.

United Kingdom

453,190. **Attaching Rubber to Other Surfaces.** National Standard Co., Niles, Mich., U. S. A.

453,224. **Cleaning Metals.** National Standard Co., Niles, Mich., U. S. A.

453,471. **Microporous Rubber.** United States Rubber Co., New York, N. Y., U. S. A.

453,532. **Coated Fabrics.** Deutsche Kunstleder-Werke Wolfang Ges.,

Wolfgang, Hanau, and P. Simons, Cologne, both in Germany.

453,702. **Reclaiming Rubber.** W. G. Essex, Lancashire.

453,836. **Treating Textiles.** Heberlein & Co., Akt.-Ges., Wattwil, and G. Heberlein, Auf der Wanne, and E. Weiss, Bundt, both in Wattwil, St. Gallen, Switzerland.

454,218. **Printing Processes.** T. L. Shepherd, London.

454,236. **Ornamenting Fabrics.** G. Cogno, Torino, Italy.

454,294. **Vulcanizing.** J. W. Waber, Chicago, Ill., U. S. A.

Germany

643,188. **Rubber Buffer Heads for Pneumatic Mail Boxes.** J. T. Needham, N. Plainfield, N. J., U. S. A. Represented by E. Jourdan and W. Paap, both of Berlin.

CHEMICAL

United States

2,072,069. **Coating Composition.** C. Elhs, Montclair, N. J., assignor to Ellis-Foster Co., a corporation of N. J.

2,072,255. **Rubber Chloride.** E. Gebauer-Fuelnegg, deceased, by M. Gebauer-Fuelnegg, administratrix, Evanston, Ill., and E. W. Moffett, Gary, Ind., assignors, by mesne assignments, to Marbo Patents, Inc., a corporation of Del.

2,072,507. **Bonded Abrasive Article.** O. L. Mahlman, Kenmore, and R. C. Benner, assignors, by mesne assignments, to Carborundum Co., both of Niagara Falls, all in N. Y.

2,072,508. **Rubber Dispersions.** O. L. Mahlman, Kenmore, and R. C. Benner, assignors, by mesne assignments, to Carborundum Co., both of Niagara Falls, all in N. Y.

2,072,596. **Rubber Composition.** W. N. Jones, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,072,631. **Thermoplastic Adhesive.** R. M. Freydberg, New York, assignor to Acme Baking Corp., Brooklyn, both in N. Y.

2,073,004. **Fireproof Composition.** R. Engelhardt, Leverkusen-I. G. Werk, Germany, assignor to I. G. Farbenindustrie A.G., Frankfurt a.M., Germany.

2,073,927. **Dispersed Adhesive.** A. D. Fuller, assignor to National Adhesives Corp., both of New York, N. Y.

2,074,876. **Puncture Proofing Composition.** H. P. Wagner, Brooklyn, assignor to Autosan Corp. of America, New York, both in N. Y.

2,074,926. **Tube Repair Composition.** W. Kruse, Hamburg, Germany, assignor to Autosan Corp. of America, New York, N. Y.

Dominion of Canada

364,396. **Insulating Compound.** N. Nardelli, Florence, Italy.

364,425. **Coating Composition.** Congoleum-Nairn, Inc., Kearny, assignee of R. D. Bonney, Glen Ridge, and W. S. Egge, East Orange, co-inventors, all in N. J., U. S. A.

364,797. **Coating Composition.** Canadian Industries, Ltd., Montreal, P. Q., assignee of J. K. Hunt, Wilmington, Del., U. S. A.

364,822. **Thermoplastic Coating.** Marathon Paper Mills Co., Rothschild, assignee of A. Abrams, C. L. Wagner, and G. W. Forcey, co-inventors, all of Wausau, both in Wis., U. S. A.

United Kingdom

453,185. **Porous Composition.** Dunlop Rubber Co., Ltd., London, and D. F. Twiss, and A. J. Hughes, Birmingham.

453,204. **Latex Plastic Compound.** F. S. Arbuthnot and J. S. Campbell, both of London.

453,299. **Coating Compositions.** R. K. Maclean, Glasgow, Scotland.

453,340. **Benzole - Piperidine Distillation.** Yorkshire Tar Distillers, Ltd., and J. S. Belford, Stourton.

453,581. **Coating Compositions.** Wingfoot Corp., Wilmington, Del., U. S. A.

453,843. **Rubber Bitumen Compositions.** A. T. B. Kell, Kent.

453,850. **Condensation Products.** Imperial Chemical Industries, Ltd., London, and R. F. Goldstein, Manchester.

453,854. **Olefine Polymers.** A. Carpmael, London. (I. G. Farbenindustrie A.G., Frankfurt a.M., Germany.)

453,921. **Rubber Substitutes.** K. W. Posnansky and C. Sandvoss, trading as Alexander & Posnansky, Dr., all of Berlin, Germany.

454,036. **Vulcanizing Compositions.** Cela Holding Soc. Anon., Luxemburg.

454,251. **Plastic Compounds.** Carborundum Co., Niagara Falls, N. Y., U. S. A.

454,288. **Arylene Diamines.** Wingfoot Corp., Wilmington, Del., U. S. A.

454,316. **Preserving Rubber.** Wingfoot Corp., Wilmington, Del., U. S. A.

454,410. **Accelerators.** Belvedere Chemical Co., Ltd., Manchester.

454,461. **Cable Protective Covering.** British Thomson-Houston Co., Ltd., London.

454,549. **Waterproofing Composition.** B. Reichert, Nomme, Esthonia, and E. Rydberg, Stockholm, Sweden.

454,576. **Stabilizing Chlorinated Rubber.** J. G. Moore, Cheshire, and Imperial Chemical Industries, Ltd., London.

454,579. **Coating Composition.** L. E. Minor, Smithville, Ont., Canada.

454,628. **Hydraulic Fluid.** G. L. Doelling, St. Louis, Mo., U. S. A.

454,738. **Latex Creaming Agent.** International Latex Processes, Ltd., St. Peter's Port, Channel Islands, and D. F. Twiss, A. S. Carpenter, and A. E. T. Neale, all of Birmingham.

454,759. **Adhesive.** Beiersdorf, Ltd., and F. G. Moore, both of Welwyn Garden City.

454,769. **Coating Composition.** G. Frenkel, Surrey.

454,809. **Gasket Compound.** Crown Cork & Seal Co., Inc., Baltimore, Md., U. S. A.

454,863. **Accelerators.** Wingfoot Corp., Wilmington, Del., U. S. A.

454,958. **Antioxidants.** Imperial Chemical Industries, Ltd., London, and W. Baird and M. Jones, both of Manchester.

Germany

642,562. **Stabilizing Polymerization Products of Butadienes Containing Halogens.** I. G. Farbenindustrie A.G., Frankfurt a.M.

642,949. **Hot Air Vulcanization.** United States Rubber Co., New York, N. Y., U. S. A. Represented by C. and E. Wiegand, both of Berlin.

GENERAL

United States

2,071,505. **Fastener.** J. W. Dews, assignor to Scoville Mfg. Co., both of Waterbury, Conn.

2,071,569. **Garment Protector.** L. H. Rand, Brooklyn, N. Y.

2,071,647. **Rubber Sponge.** V. L. Miller, assignor to Faultless Rubber Co., both of Ashland, O.

2,071,706. **Water Bag.** M. B. Reach, Springfield, assignor to Stopperless Water Bottle Co., Chicopee, both in Mass.

2,071,783. **Fur Trimmed Overshoe.** E. W. Dunbar, Hudson, assignor to Cambridge Rubber Co., Cambridge, both in Mass.

2,071,815. **Dispensing Container.** A. J. Chamberlain, Wauwatosa, Wis.

2,071,827. **Football Armor.** F. W. Glahe, Chicago, Ill., assignor to A. G. Spalding & Bros., New York, N. Y.

2,071,842. **Faucet Connection.** B. H. Kennedy, Rochester, N. Y.

2,072,030. **Raincoat and Pocketbook.** W. T. Damron, Roanoke, Va.

2,072,038. **Infant's Bathing Device.** B. H. Kennedy, Rochester, N. Y.

2,072,097. **Waterproofing Frictional-Type Material.** T. L. Cunningham, New York, N. Y., assignor to Drigard Products Corp., a corporation of Del.

2,072,129. **Abrading Tool.** F. Ricks and E. Hope, both of Leicester, England, assignors to United Shoe Machinery Corp., Paterson, N. J.

2,072,169. **Truss.** A. C. Herzberg, Memphis, Tenn.

2,072,184. **Bathing Trunks and Supporter.** D. Rheinauer, assignor to New York Knitting Mills, Inc., both of New York, N. Y.

2,072,188. **Saddle Pad.** L. Tauber, Jamaica, N. Y.

2,072,219. **Flexible Support.** S. J. Robison, Chicago, Ill.

2,072,225. **Rubber Accessory.** A. G. Slater, Miles City, Mont.

2,072,244. **Deadening Means for Office Machines.** W. L. Coursen, New Rochelle, N. Y.

2,072,345. **Bath Sprays.** W. C. Schneider, assignor to Seamless Rubber Co., Inc., both of New Haven, Conn.

2,072,352. **Garter Purse.** R. Wyland, New York, N. Y.

2,072,366. **Bulb Syringe.** G. N. Hein, San Francisco, Calif.

2,072,426. **Container.** H. T. Kraft, assignor to General Tire & Rubber Co., both of Akron, O.

2,072,441. **Thermometer Case.** G. L. Cameron, Montclair, N. J.

2,072,459. **Air Bag.** S. W. Lippitt, Cleveland, O.

2,072,483. **Bathing Cap.** W. K. Naundorf, Scheveningen, Netherlands.

2,072,518. **Ice-Making Tube Closure.** M. J. Brown, Niagara Falls, N. Y.

2,072,541. **Glove.** J. Burnham, assignor to F. H. Burnham Co., both of Michigan City, Ind.

2,072,550. **Undergarment.** H. W. Faulkner, assignor to Marshall Field & Co., both of Chicago, Ill.

2,072,557. **Flame Resisting Conductor.** A. P. Hinsky, assignor to Pyro Products Corp., both of Brooklyn, N. Y.

2,072,559. **Garment Supporter.** J. Jacobs, Bridgeport, assignor to A. J. Donahue Corp., Milford, both in Conn.

2,072,570. **Spring Cushion.** R. O.

Smith, assignor to Owen Silent Spring Co., Inc., Bridgeport, Conn.

2,072,629. **Coupling Device.** E. Fernholz, Berlin-Tempelhof, Germany.

2,072,644. **Raincoat.** A. McBee, Baltimore, Md.

2,072,673. **Comb.** L. Greenspan, Brooklyn, N. Y.

2,072,765. **Sole.** L. M. Oakley, assignor to Essex Rubber Co., both of Trenton, N. J.

2,072,775. **Elastic Yarn.** H. A. Smith, Needham, Mass., and J. J. Fodor, Yonkers, N. Y., assignors to F. W. Gorse Co., Needham Heights, Mass.

2,072,802. **Container.** H. T. Kraft, assignor to General Tire & Rubber Co., both of Akron, O.

2,072,839. **Combination Garment.** P. H. Robbins, assignor to Poirette Corsets, Inc., both of New York, N. Y.

2,072,896. **Tire Cover.** G. A. Lyon, Allenhurst, assignor to Lyon, Inc., Asbury Park, both in N. J.

2,079,905. **Train Pipe Connecter.** J. Robinson, New York, N. Y., assignor of ½ to R. M. Wolvin, Montreal, P. Q., Canada.

2,073,047. **Loom Picker Stick Strap.** H. J. Barnett, Danielson, Conn.

2,073,122. **Placer Mining Device.** G. P. Silke, Vancouver, B. C., Canada.

2,073,137. **Sanitary Cover.** F. H. Bimrose, Dillon, Mont.

2,073,192. **Gas Mask.** K. Connell, Branch, N. Y.

2,073,294. **Hose Clamp.** M. U. Caillau, Boulogne-sur-Seine, France.

2,073,301. **Waterproofing.** S. D. Gehman, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.

2,073,303. **Flexible Oiler.** J. H. Holder, Long Beach, Calif.

2,073,307. **Bath Spray.** S. Isenberg, Chicago, Ill.

2,073,335. **Breathing Tube.** K. Connell, Branch, N. Y.

2,073,347. **Collapsible Wheel.** Ward Leathers, Haworth, N. J., assignor to Quadrex Corp., New York, N. Y.

2,073,369. **Eraser Attachment.** J. S. Furst, Philadelphia, Pa.

2,073,372. **Gas Administering Machine Meter.** J. A. Heidbrink, Minneapolis, Minn.

2,073,379. **Stencil Device.** C. H. Rasmussen, Des Moines, Iowa.

2,073,419. **Resilient Joint.** M. Houdaille and C. Lecler, Levallois-Perret, France.

2,073,534. **Pneumatic Cushion.** M. Howald, Massillon, O.

2,073,558. **Broom.** O. Linder, Pittsburgh, Pa.

2,073,668. **Power Transmitting Mechanism.** H. A. Wilson, West Allis, assignor to Allis-Chalmers Mfg. Co., Milwaukee, both in Wis.

2,073,737. **Teat-Cup.** C. E. Ellison, Norrkoping, Sweden.

2,073,749. **Spare Tire Well and Cover.** G. A. Lyon, assignor to Lyon, Inc., both of Detroit, Mich.

2,073,766. **Air Valve for Balls.** S. Suzuki, Tokyoshi, Japan.

2,073,791. **Fly Catcher.** R. A. Graef, Laurys Station, Pa.

2,073,800. **Surgical Device.** W. King, Glencoe, N. M.

2,073,818. **Tensioning Means.** H. J. Viens, assignor to Lorraine Mfg. Co., both of Pawtucket, R. I.

2,073,824. **Hose Coupling.** C. M. C. Baird, Evanston, Ill.

2,073,845. **Tire Cover Construction.** G. A. Lyon, Detroit, Mich., assignor to Lyon, Inc., Asbury Park, N. J.

2,073,852. **Drive Connecting Link.** W. H. Radford, Peoria, Ill., assignor to Caterpillar Tractor Co., San Leandro, Calif.

2,073,872. **Vehicle.** V. W. Kliesrath, South Bend, Ind., assignor to Steel Wheel Corp., Chicago, Ill.

2,074,050. **Heel Pad.** W. J. Dwyer, San Francisco, Calif.

2,074,114. **Grinding Wheel.** T. Larson, assignor to Norton Co., both of Worcester, Mass.

2,074,140. **Nonporous Gloves.** L. N. Bates, Fremont, O.

2,074,146. **Golf Practice Device.** F. B. Hewel, Pittsburgh, Pa.

2,074,180. **Tennis Ball Holder.** F. J. Hatley, Maywood, Ill.

2,074,208. **Bathing Cap.** F. Brighten, London, England.

2,074,223. **Blood Transfusion Apparatus.** F. T. Horiuchi, New York, N. Y.

2,074,272. **Hose Supporter.** P. Pugniet, Saint-Mande, France.

2,074,284. **Rim, Wheel, and Tire.** A. C. Stevenson, Fleet, England.

2,074,286. **Arch Builder.** C. Sullivan, Springfield, Mo.

2,074,340. **Vehicle Springing System.** E. H. Piron, Highland Park, Mich., assignor, by mesne assignments, to Transit Research Corp., New York, N. Y.

2,074,374. **Intestinal Irrigator.** F. F. D. de Mendoza Suarez, Paris, France.

2,074,385. **Auto Door Stop.** H. D. Geyer, Dayton, O., assignor to General Motors Corp., Detroit, Mich.

2,074,386. **Radio Antenna.** H. D. Geyer, Dayton, O., assignor to General Motors Corp., Detroit, Mich.

2,074,435. **Refrigerating Apparatus.** E. F. Schweller, assignor to General Motors Corp., both of Dayton, O.

2,074,519. **Golf Tee.** E. A. Shephard, Oakland, Calif.

2,074,520. **Blood Pressure Tester.** G. A. Snyder, W. Hollywood, Calif.

2,074,532. **Graining.** W. G. Bihler and H. J. Schuldt, assignors to General Motors Corp., both of Detroit, Mich.

2,074,579. **Shoe Structure.** A. Fesl, Chicago, Ill.

2,074,674. **Dispensing Device.** H. Sadjian, Philadelphia, Pa.

2,074,762. **Dermatoid Glove.** F. R. Seyfried, Toledo, O.

2,074,769. **Dining Table Equipment.** E. J. Braun, Stamford, Conn., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,074,776. **Combination Garment.** R. F. Cotey and C. H. Fleck, assignors to S. H. Camp & Co., Jackson, iMch.

2,074,796. **Brassiere.** G. C. Mason, Jr., assignor to Gem-Dandy Garter Co., both of Madison, N. C.

2,074,808. **Ball.** C. H. Rickey, assignor to Crawford, McGregor & Canby Co., both of Dayton, O.

2,074,826. **Rubber Insulation.** C. R. Boggs, Waban, assignor to Simplex Wire & Cable Co., Boston, both in Mass.

2,074,956. **Wire Rope.** F. C. Carstarphen, Denver, Colo., assignor to American Steel & Wire Co., N. J., a corporation of N. J.

2,074,975. **Garment.** M. C. Baatz, South Orange, N. J., assignor to Model Brassiere Corp., Brooklyn, N. Y.

Dominion of Canada

364,515. **Pneumatically Tired Wheel.** E. W. Baumann, Detroit, Mich., U. S. A.

364,526. **Garment Band.** L. W. Joyce, Greenboro, N. C., U. S. A.

364,535. **Insole.** J. Muller, Prague, Czechoslovakia.

364,553. **Saddle Seat.** H. M. Pryale, Pontiac, Mich., U. S. A.

364,559. **Life Preserver.** F. G. Manson, Dayton, O., U. S. A.

364,614. **Wheel.** Transit Research Corp., assignee of E. H. Piron, both of New York, N. Y., U. S. A.

364,656. **Articulated Doll.** Sun Rubber Co., Barberton, assignee of M. S. Lower, Wadsworth, both in O., U. S. A.

364,660 and 364,661. **Elastic Spring.** Transit Research Corp., assignee of E. H. Piron, both of New York, N. Y., U. S. A.

364,768. **Hose.** Whitehead Bros. Rubber Co., Trenton, assignee of F. B. Williamson, Jr., Elizabeth, both in N. J., U. S. A.

364,795. **Fur Trimmed Article.** Cambridge Rubber, Ltd., St. Remi de Napierville, P. Q., assignee of E. W. Dunbar, Hudson, Mass., U. S. A.

364,842. **Tire Chain Applicator.** G. W. Rinck, Washington, inventor, J. H. Elliott, South Heights, and E. S. McGarvey, Pittsburgh, each an assignee of twenty-four one-hundredths of the interest, all in Pa., U. S. A.

364,867. **Wall Plug.** W. W. Hamill, Chigwell, England.

364,868 and 364,869. **Tire Tread.** P. E. Hawkinson, Minneapolis, Minn., U. S. A.

364,891. **Knitting Needle Stitch Holder.** H. A. Webber, Coronado, Calif., U. S. A.

364,950. **Rubber Valve Stem.** Firestone Tire & Rubber Co. of Canada, Ltd., Hamilton, Ont., assignee of T. J. Ellis, Akron, O., U. S. A.

364,954. **Ring Packing.** Johns-Manville Corp., New York, N. Y., assignee of G. Christenson, North Plainfield, N. J., both in the U. S. A.

365,005. **Wood Sanding and Polishing Machine.** D. S. Sinclair, Wiarton, Ont.

United Kingdom

453,026. **Cellular Rubber.** Soc. Des Appareils Orthopediques Unic, Seine, France.

453,064. **Vibration Dampers.** V. A. Trier, Andre Works, London.

453,065. **Nonconducting Coverings for Sound.** Turner & Newall, Ltd., Rochdale, and W. G. Still, Durham.

453,068. **Microphones.** Graham & Co., Ltd., Westminster, and C. H. Vaughan, Kent.

453,069. **Desks.** G. L. Carrier, Southampton.

453,085. **Artificial Respiration Apparatus.** J. E. Pollak, London. (Aktiebolaget Stille-Werner, Stockholm, Sweden.)

453,091. **Golf Balls.** Dunlop Rubber Co., Ltd., London, and D. F. Twiss, A. E. Neale, and L. A. Bradbury, all of Birmingham.

453,105. **Flexible Shafts.** G. Ducart, Paris, France.

453,144. **Motor Sledges.** A. G. Grant, Ontario, Canada.

453,177. **Flexible Rods.** E. A. Ward, Birmingham.

453,178. **Locking Valves.** H. P. Folland, Cheltenham.

453,185. **Golf Balls.** Dunlop Rubber Co., Ltd., London, and D. F. Twiss,

and A. J. Hughes, both of Birmingham.
453,213. **Hinges.** J. D'Albay, Paris, France.
453,227. **Spring Upholstery.** A. N. H. Thomson, Annandale, Australia.
453,319. **Typewriters.** W. C. Fairweather, London. (Underwood Elliott Fisher Co., New York, N. Y., U. S. A.)
453,370. **Insoles.** F. W. Farr, Northampton.
453,380. **Windscreen Wipers.** Trico Products Corp., Buffalo, N. Y., U. S. A.
453,382. **Vehicle Spring Suspensions.** J. Kolbe, Hannover, Germany.
453,388. **Motor Vehicles.** H. C. Nugent, Lambourn.
453,390. **Phonographic Recorders.** L. D. Norton, Bridgeport, Conn., U. S. A.
453,425. **Skates.** S. P. Shaw, Hull.
453,426. **Knee Protectors.** G. A. Gambie, Hull.
453,461. **Dustpans.** H. T. Shakespeare, Garrison Works, Birmingham.
453,544. **Tires.** Firestone Tire & Rubber Co., Ltd., Brentford, assignee of C. G. Hoover.
453,560. **Pit Props.** W. Fehlemann, Duisburg, Germany.
453,561. **Sinks.** J. Haussmann, Bas-Rhin, France.
453,573. **Tires.** A. G. Fitzgerald, West Newton, Mass., U. S. A.
453,597. **Aircraft with Rotary Wing Systems.** R. P. Pescara, Paris, France.
453,598. **Cables.** Telegraph Construction & Maintenance Co., Ltd., London, J. N. Dean, Bromley, and F. Mattingley, London.
453,601. **Vacuum Cleaners.** F. B. Holmes- Higgin, Kent.
453,619. **Laminated Springs.** H. W. Porter and J. F. Bridge, Sheffield.
453,649. **Yarns.** Everlastic, Ltd., and H. A. Raynor, Nottingham.
453,654. **Sealing Bottles.** A. H. Smith, Surrey, A. J. Marek, London, and S. A. Screeton, Bromley.
453,688. **Tires.** G. A. Betulander, Stockholm, Sweden.
453,671. **Applying Disk to Milk Bottles.** A. H. Smith, Surrey, A. J. Marek, London, and S. A. Screeton, Bromley.
453,690. **Closures for Canisters.** Vacseal Containers, Ltd., Westminster, and T. W. Phillips, London.
453,726. **Attaching Furniture to Floors.** G. R. Shaw, Surrey.
453,746. **Hydraulic Power Transmission.** P. Gauthier, Seine, France.
453,798. **Look-out Apparatus for Vehicles.** G. E. Jukes, London.
453,806. **Shaft Couplings.** H. P. Lake, London.
453,808. **Vehicle Suspensions.** F. E. Maier, Berlin, Germany.
453,814. **Rollers for Treating Fabrics.** F. Schuster, Chemnitz, Germany.
453,840. **Cables.** Okonite Co., Passaic, N. J., U. S. A.
453,860. **Fluid Actuated Valves.** A. P., A. P. L., and C. G. Blaxter, and C. W. Raymond, all of London.
453,867. **Shoe Racks.** British United Shoe Machinery Co., Ltd., and W. Barnett, both in Leicester.
453,876. **Vehicle Wheels.** F. W. Baker, Stourbridge, Worcestershire.
453,899. **Valves.** W. Turner, Eyre Works, Sheffield.
453,910. **Tires.** H. Baron, London. (Blodner Spezialfabrik fur Stahlmobel & Eisenbau Ges., A. Goth and L. betz, Berlin, both in Germany)
453,926. **Flyer Spinning Frame.** Duvivier, Six & Sanacq, Roubaix, France.
453,932. **Vehicle Wheels.** F. Freh, Vienna, Austria.
453,949. **Massaging Appliances.** G. Arcari, Edinburgh, Scotland.
453,954. **Hats.** Patent Pulp Mfg. Co., Ltd., and C. J. Sear, both of Thetford.
453,970. **Cleaning Casks.** W. O. Green, London.
453,975. **Denture Containers.** G. Parizot, Stockholm, Sweden.
453,982. **Wearing Apparel.** S. G. Strauss, Manchester.
453,984. **Folding Nozzles.** J. Staller, Zeletava, Czechoslovakia.
454,002. **Paving Blocks.** Soc. Italiana Pirelli, Milan, Italy.
454,039. **Pipe Joints.** Soc. Anon. Des Hauts-Fourneaux & Fonderies De Pont-A-Mousson, Pont-a-Mousson, Meurthe & Moselle, France.
454,041. **Batteries.** Chance Bros. & Co., Ltd., Birmingham, and J. W. Jolly, Westminster.
454,045. **Scutching Flax.** C. Decuypere, Rekkem, and M. Dujardin, Lauwe, both in Belgium.
454,098. **Vibration Dampers.** V. A. Trier, London.
454,114. **Brushes.** S. J. Hayward, Excelsior Brush Works, Bloxwich, Staffordshire.
454,153. **Waistbands.** E. Herrmann, Kleinschoenebeck, Germany.
454,177. **Cooling Cylinders.** G. L. B. Hall, Derby.
454,184. **Combined Buffing for Vehicles.** A. Spencer and Spencer Moulton & Co., Ltd., Westminster.
454,225. **Pipe Joints.** W. E. Pickford, Sheffield.
454,236. **Coated Fabrics.** G. Cogno, Torino, Italy.
454,269. **Waterproof Garments.** D. Levy, Manchester.
454,294. **Tires.** J. W. Waber, Chicago, Ill., U. S. A.
454,307. **Buttons.** C. E. Hart, Glasgow. Scotland.
454,314. **Vehicle Wheels.** H. C. Brinkers, Wassenaar, and H. F. Torringa, E. J. H. Van Delden, and R. T. Schorr, all in The Hague, both in Holland.
454,316. **Tires.** Wingfoot Corp., Wilmington, Del., U. S. A.
454,325. **Casks.** B. Allen, Warwickshire.
454,345. **Mats.** J. L. Gasking, Walsall.
454,352. **Vehicle Windows.** H. F. L. J. Rocheron, Paris, France.
454,355. **Laces.** C. Meier, Paris, France.
454,378. **Tires.** A. H. Finlay, Down, Northern Ireland
454,416. **Pencil Holders.** Fend Crayonsfabrik Ges. Geb., Pforzheim, Germany.
454,437. **Preventing Dimming of Windows.** J. Lucas, Ltd., and E. A. Watson, Birmingham.
454,452. **Compound Fabrics.** J. Kenyon & Son, Ltd., and J. H. Sleigh, Bury.
454,481. **Hair Drying Appliances.** G. Ducart, Paris, France.
454,494. **Radiators for Motor Vehicles.** Leyland Motors, Ltd., Kingston-on-Thames, and N. Isherwood, Bolton.
454,516. **Signs.** E. T. Johnston, London.
454,529. **Foot Arch Supports.** H. Vogel, Frankfurt a.M., Germany.
454,537. **Catamenial Appliances.** O. Schurch, Biel, Switzerland.

TRADE MARKS

United States

343,452. Oval containing the word: **"Theftproof."** Garden hose. Gates Rubber Co., Denver, Colo.
343,455. **Koolies by Miller.** Corsets, girdles, etc. Miller Corsets, Inc., Canandaigua, N. Y.
343,458. Square containing circle containing representation of mortar and pestle and the word: **"Imperials"** above the circle and the words: **"Prescription Brand"** below it. For membraneous and rubber prophylactic articles. E. G. Fletcher, Cincinnati, O.
343,467. **Burroughs.** Typewriters and parts. Burroughs Adding Machine Co., Detroit, Mich.
343,476. Representation of a double typewriter eraser containing the words: **"A. W. Faber 'Castell'"** and underneath, the words: **"4 in 1".** Erasers. A. W. Faber, Inc., Newark, N. J.
343,610. **Foodtex.** Balata and cotton belting. Victor Balata & Textile Belting Co., Easton, Pa.
343,614. **Sport Champ.** Baseballs, golf balls, basketballs, footballs, soccer balls, etc. Supplee-Biddle Hardware Co., doing business as Crown Mfg. Co., Philadelphia, Pa.
343,647. **Supreme.** Tire repair gum materials. Firestone Tire & Rubber Co., Akron, O.
343,649. Jagged circle containing the word: **"Pure."** Top patches, fan belts, hot patches for repairing tubes, repair kits, blowout boots, and radiator hose. Pure Oil Co., Chicago, Ill.
343,650. Jagged circle containing the word: **"Pure."** Friction tape and gasket and rim cement. Pure Oil Co., Chicago, Ill.
343,651. Jagged circle containing the word: **"Pure."** Batteries and battery cables. Pure Oil Co., Chicago, Ill.
343,660. **Torcy.** Combs. Foreign Specialties, Inc., New York, N. Y.
343,731. **Marlo.** Machinery packing, transmission belting, and brake lining. H. Case, doing business as Marlo Co., New York, N. Y.

NEW ENGLAND

(Continued from page 71)

The Norwalk Tire & Rubber Co., Inc., Norwalk, Conn., has reported that net sales for the first six months of its fiscal year, October, 1936, through March, 1937, amounted to more than 72½% over the figure for the corresponding period of the previous year. The company believes that the greatest factor in this increase is the demand for its "5" and "7" Plus Ply line of tires.

Phillips-Baker Rubber Co., 44 Warren St., Providence, R. I., has closed because of labor trouble, and the management is formulating plans for liquidation of the business, according to a Mr. Waring, of Edwards & Angell, counsel for the company. A stockholders' meeting was scheduled for April 28 to decide on final arrangements.

Market Reviews

CRUDE RUBBER

Commodity Exchange

TABULATED WEEK-END CLOSING PRICES

Futures	Feb. 27	Mar. 27	Apr. 3	Apr. 10	Apr. 17	Apr. 24
Mar.	21.85	26.25	.....	.....	.....	.....
Apr.	21.90	26.27	26.27	24.38	22.51	23.21
May	.....	.....	26.29	24.40	22.53	23.23
July	22.10	26.36	26.49	24.64	22.72	23.35
Sept.	22.13	26.27	26.48	24.65	22.83	23.38
Dec.	22.13	26.27	26.44	24.63	22.86	23.40
Feb.	.....	.....	26.45	24.58	22.82	23.37
Volume per week (tons)...	24,170	22,840	40,990	42,560	39,930	22,850

New York Quotations

New York outside market rubber quotations in cents per pound

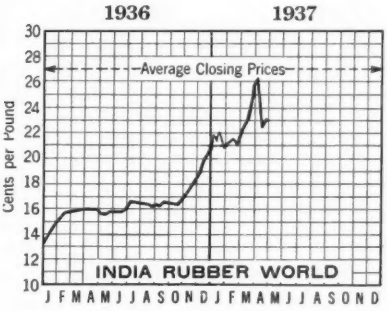
Plantations	Apr. 27, 1936	Mar. 27, 1937	Apr. 27, 1937
Rubber latex..*gal.*	60/61	92/93	79/80
Paras			
Upriver fine	19	22½	22¾
Upriver fine	*21	*29⅝	*28
Upriver coarse ...	13	16	14½
Upriver coarse ...	*17	*23⅞	*22¾
Islands fine	19	22½	22
Islands fine	*21	*29¾	*27¾
Acre, Bolivian fine	19	22¾	23
Acre, Bolivian fine	*21½	*29¾	*28½
Beni, Bolivian ...	19½	23¼	23½
Madeira fine	19	22¾	22¾
Caucho			
Upper ball	13	16	14
Upper ball	*17	*23⅞	*22½
Lower ball	12½	15	13¾
Pontianak			
Bandjermasin	7	6	7
Pressed block	12	10/25	11/30
Sarawak	7	6	..
Guayule			
Duro, washed and dried	13	16	16
Ampar	13½	17½	17½
Africans			
Rio Nuñez	15⅛	22	21
Black Kassai	15⅛	22	21
Prime Niger flake.	25	29	28
Gutta Percha			
Gutta Siak	11½	10½	11
Gutta Soh	13¾	14	15
Red Macassar	1.25	1.05/1.30	1.00/1.05
Balata			
Block, Ciudad Bolivar	27	32	32
Manaos block	27	27	28
Surinam sheets ..	35	32	35
Amber	39	40	38

*Washed and dried crepe. Shipments from Brazil.

THE Commodity Exchange table gives prices of representative future contracts on the New York market during approximately the last two months.

Since March 27 the market trading continued active, but prices for July delivery declined to 22.72¢ on April 17, and increased to 23.35¢ on April 24, in comparison with 26.36¢ on March 27 and 21.18¢ on February 20. Prices on futures for delivery throughout the year were uniform with a variation of only 0.35¢ as a maximum.

The following figures were released April 15 by The Rubber Manufacturers Association, Inc. Consumption of crude rubber by manufacturers in the United States for March is estimated to be 52,938 long tons, or an increase of 5.3% over the usage of 50,282 long tons in February, and 24% above the figure of 42,703 long tons for March, 1936. Gross imports for March are reported at 52,039 long tons, an increase of 20.2% over the February figure of 43,289 long tons and 39% over the 37,451 long tons imported in March, 1936. Total domestic stocks are estimated at 191,618 long tons as of March 31, 193,864 long tons on February 28 and 276,823 long tons of crude rubber on hand March 31, 1936. The R. M. A. also estimates the amount of crude rubber afloat to United States ports as 56,994 long tons as of March 31, as compared with 53,538 long tons afloat on February 28 and 58,935 on March 31, 1936. For the first three months of 1936 crude consumption in the United States is estimated at a record figure of 151,964 long tons in comparison with 127,955 long tons, or an increase of 19% over the same period in 1936. On the basis of average monthly consumption for the first three months of 1936, stocks at the end of March, 1937, represent 3.8 months' supply as compared with 4.4 months' supply on December 31, 1936, and 6.5 months' supply as of March 31, 1936. As some rubber factories have been closed because of strikes during March and April and thus under full production, the position of stocks on hand would have presented a still further decline.



New York Outside Market—Spot Ribbed Smoked Sheets

New York Outside Market

Factory buying was steady throughout April. No. 1 ribbed smoked sheets went up from 26¢ per pound on March 25 to 26⅞¢ on April 1 and then took a gradual downward path, hitting 24⅛¢ on April 9, a low of 22½¢ on April 17, and closed at 23⅛¢ on April 24. Consumption increased slightly over February in spite of continued automobile strikes.

The week-end closing prices on No. 1 smoked ribbed sheets follow: April 3, 26 7/16¢; April 10, 24 7/16¢; April 17, 22½¢; and April 24, 23⅛¢ per pound.

"Report of Fire Tests in Small Closed Rooms with Automatic Bulb-Type Carbon Tetrachloride Fire Extinguishers." Underwriters Laboratory, Inc., 207 E. Ohio St., Chicago, Ill., March 5, 1937. A ten-page report describes the test to which the carbon tetrachloride bulbs were subjected and the results obtained.

New York Outside Market—Spot Closing Prices—Plantation Grades—Cents per Pound

	—March, 1937—			—April, 1937—																	
	29	30	31	1	2	3	5	6	7	8	9	10	12	13	14	15	16	17	19	20	21	22	23	24
No. 1 Ribbed Smoked Sheet	26 3/8	26 7/8	26 1/2	26 7/8	26 3/8	26 3/8	25 3/4	25 5/8	24 5/8	24 5/8	24 1/8	24 7/8	23 3/8	23 1/8	22 1/2	22 3/8	22 1/8	22 1/2	22 7/8	22 5/8	23 1/4	23 1/8	23	23 1/8
No. 2 Ribbed Smoked Sheet	26 1/2	26 3/4	26 3/8	26 5/8	26 1/4	26 1/8	25 3/8	25 1/8	24 1/8	24 1/2	24	24 3/8	23 1/8	23	23 3/8	22 1/4	22 1/8	22 1/8	22 1/2	23 3/8	23 1/8	22 7/8	23	
No. 3 Ribbed Smoked Sheet	26 3/8	26 1/8	26 1/8	26 1/8	26 1/8	26	25 3/8	25 3/8	24 1/8	24 1/8	23 7/8	24 1/4	23	22 7/8	22 3/8	22 1/8	21 7/8	22 1/8	22 3/8	23 1/8	22 7/8	22 7/8	22 7/8	
No. 4 Ribbed Smoked Sheet	26 1/4	26 1/8	26 1/8	26 1/8	26 1/8	25 7/8	25 1/8	25 1/4	24	24 1/8	23 7/8	24 1/8	22 7/8	22 7/8	22 3/8	22 1/8	21 7/8	22 1/4	22 5/8	22 3/8	23	22 7/8	22 7/8	
No. 1 Thin Latex Crepe...	30 3/8	31	31	31 1/2	30 3/8	30 1/4	29 3/4	29 1/8	28	28	27 1/2	28	26 1/4	26 1/8	26 1/2	26	26	26 1/4	26 3/8	26 1/4	26 1/4	26 1/4	26 1/4	26 3/8
No. 1 Thick Latex Crepe..	30 3/8	31	31	31 1/2	30 3/8	30 1/4	29 3/4	29 1/8	28	28	27 1/2	28	26 1/4	26 1/8	26 1/2	26	26	26 1/4	26 3/8	26 1/4	26 1/4	26 1/4	26 1/4	26 3/8
No. 1 Brown Crepe.....	26 1/8	26 3/8	26	26 1/8	25 3/8	25 1/8	25	24 3/8	23 7/8	24	23 1/2	23 3/8	22 1/8	22 1/2	21 7/8	21 3/4	21 5/8	22	22 1/4	22	22 3/8	22 1/2	22 3/8	22 1/2
No. 2 Brown Crepe.....	25 1/8	26 1/4	25 7/8	26	25 1/2	25 1/8	24 7/8	24 1/8	23 1/8	23 7/8	23 3/8	23 1/8	22 7/8	22 3/8	21 3/4	21 5/8	21 1/2	21 7/8	22 1/8	21 7/8	22 1/2	22 3/8	22 1/4	22 3/8
No. 2 Amber.....	26 1/8	26 3/8	26	26 1/8	25 3/8	25 1/8	25	24 3/8	23 7/8	24	23 1/2	23 3/8	22 1/8	22 1/2	21 7/8	21 3/4	21 5/8	22	22 1/4	22	22 3/8	22 1/2	22 3/8	22 1/2
No. 3 Amber.....	25 1/8	26 1/4	25 7/8	26	25 1/2	25 1/8	24 7/8	24 1/8	23 1/8	23 7/8	23 3/8	23 1/8	22 7/8	22 3/8	21 3/4	21 5/8	21 1/2	21 7/8	22 1/8	21 7/8	22 1/2	22 3/8	22 1/4	22 3/8
No. 4 Amber.....	25 1/8	26	25 3/8	25 3/4	25 1/4	25 1/8	24 1/2	24 1/8	23 1/8	23 3/8	23 1/8	23 1/8	22 1/8	22 1/8	21 1/2	21 3/8	21 1/4	21 3/8	21 7/8	21 3/8	22 1/4	22 1/8	22	22 1/8
Rolled Brown	24	24 1/8	23 3/4	23 7/8	23 3/4	24	23 1/2	23 1/8	22 1/8	22 3/8	22 1/8	22 1/8	21 1/8	21 1/8	20 1/2	20 3/8	20 1/4	20 3/8	21	20 7/8	21 1/2	21 3/8	21 1/4	21 3/8

IMPORTS, CONSUMPTION, AND STOCKS

United States and World Statistics of Rubber Imports, Exports, Consumption, and Stocks

Twelve Months	U. S. Imports* Tons	U. S. Consumption¶ Tons	U. S. Mfgrs. Importers, Dealers, Etc.† Tons	U. S. Stocks Afloat† Tons	U. K.— Public Warehouses, London, Liverpool†‡ Tons	Singapore and Penang Dealers and Port Stocks†‡ Tons	World Production (Net Exports)‡ Tons	World Consumption Estimated‡ Tons	World Stocks†‡§ Tons
1934	469,484	453,223	355,000	47,644	134,927	62,142	1,019,200	924,141	729,391
1935	448,116	491,544	303,000	39,094	164,295	28,304	872,800	938,489	634,170
1936	490,860	573,552	218,844	56,567	78,462	26,969	855,914	1,039,285	455,227
1936									
January ...	31,292	48,506	285,054	43,870	162,107	31,195	62,726	**83,993	569,826
February ..	35,219	36,746	282,902	46,532	157,028	38,421	64,019	68,635	572,323
March	37,451	42,703	276,823	58,935	147,712	29,322	69,252	80,132	590,475
April	40,370	51,897	264,228	47,678	140,404	32,200	60,030	85,336	527,178
May	35,598	50,482	248,317	48,860	130,590	26,687	68,838	90,090	492,582
June	41,835	52,636	245,886	47,228	122,285	28,260	66,478	87,830	532,992
July	35,881	48,127	234,498	60,343	113,386	29,493	83,850	86,698	490,074
August	42,563	46,657	229,056	63,597	108,215	28,289	71,213	81,378	468,238
September.	48,386	46,330	228,477	62,240	103,962	26,936	72,314	82,288	490,602
October ...	40,920	49,509	219,553	67,825	96,625	24,593	81,756	91,602	450,560
November..	44,296	50,303	212,515	73,691	88,781	26,761	78,355	88,742	436,657
December..	57,049	49,626	218,844	56,567	78,462	26,969	77,083	92,358	455,227
1937									
January...	32,820	48,744	201,915	55,096	71,062	36,365	71,519	90,405	412,404
February ..	43,289	50,282	193,864	53,538	63,760	42,132	70,417	92,987	398,369
March	52,039	52,938	191,168	56,994	.....	.....	.....	.....	.....

* Including liquid latex. †Stocks on hand the last of the month or year. ‡Statistical Bulletin of the International Rubber Regulation Committee. §Stocks at U. S. A., U. K., Singapore and Penang, Para, Manaos, and afloat. ¶Corrected to 100% from estimate of reported coverage. **Not including additional absorption from U.K. manufacturers' stocks for any month during 1936. The figure will be included in yearly total.

CRUDE rubber consumption by United States manufacturers for March is estimated at 52,938 long tons, against 50,282 long tons for February, an increase of 5.3% over February and 24% above the 42,703 long tons consumed in March, 1936, according to the R. M. A.

Gross imports of crude rubber for March totaled 52,039 long tons, 20.2% over the February figure of 43,289 long tons and 39% over the 37,451 long tons imported in March, 1936.

Total domestic stocks of crude rubber on hand March 31 are estimated at 191,618 long tons, compared with February 28 stocks of 193,864 long tons and 276,823 long tons on hand March 31, 1936.

Crude rubber afloat to U. S. ports as of March 31 is figured to be 56,994 long tons, against 53,538 long tons afloat on February 28 and 58,935 long tons afloat on March 31, 1936.

London and Liverpool Stocks

Week Ended	Tons London	Tons Liverpool
Mar. 27.....	22,463	31,355
Apr. 3.....	21,314	30,265
Apr. 10.....	21,599	29,203
Apr. 17.....	21,285	29,077
Apr. 24.....	22,145	29,135

EASTERN

(*Continued from page 74*)

E. E. Allen, of the National-Erie Corp., Erie, Pa., who was recently in the East, reports that business is very good and that buying of rubber machinery continues very active.

William Hohwieler, president of the Hohwieler Rubber Co., Morrisville, Pa., has been appointed a member of the Sea Scout Committee of the Morrisville Chamber of Commerce.

Jean Le Bras, representative of the Institut Francais de Caoutchouc, Place Marcellin Berthelot, Paris, 5e, France, is visiting this country to establish contacts with the rubber manufacturers. The Institut was established in October, 1936, to promote the growth of the rubber industry in France, is supported by the French government from taxes levied on rubber, and maintains a laboratory for experimental purposes. The Insitut has a permanent exhibit of rubber products, compounding ingredients, etc., to which manufacturers of this country have contributed.

L. H. Hoag, formerly associated with INDIA RUBBER WORLD for a number of years, is vice president and treasurer of the Spadone-Hoag Corp., organized recently to act as distributing agent for Metaline oilless bearings manufactured by the R. W. Rhoades Metaline Co., 50-17 Fifth St., Long Island City, N. Y. C. C. Spadone, head of the Spadone Machine Co., long manufacturer of special equipment for the rubber industry, is president of the new corporation, which also has its offices at 122 E. 25th St., New York, N. Y.

Tire Machinery & Equipment Co. has changed its name to the Erlinger & Welch Rubber Co., Inc. George J. Erlinger now has associated with him C. J. Welch, for years prominently identified with the tire industry. The new concern continues operations at 567 First Ave., New York, N. Y., acting as distributer for Kelly-Springfield tires and Globe batteries. Mr. Erlinger, who formed the Tire Machinery & Equipment Co. more than 18 years ago as a manufacturer of vulcanizing equipment, has been for many years active in tire trade association work. For 22 years Mr. Welch was associated with the United States Tire Co., as manager of tire sales and manager of manufacturers' sales. He retired from U.S. in 1930 to enter the retail tire business for himself and formed the Welch Rubber Co. in New York.

S. S. White Dental Mfg. Co., Philadelphia, Pa., held an annual meeting last month at which stockholders approved amendments to the by-laws. Directors elected were R. Stockton White and Charles S. Ristine.

General Electric Co., Schenectady, N. Y., has opened an exhibit of electrical products for industry in the General Electric Building, 570 Lexington Ave., New York, N. Y., which brings together, in 7,000 square feet of floor space, a complete line of representative products of General Electric and its affiliates. By means of cable dumbbell samples visitors may test the strength of various rubber insulations both before and after undergoing heat, aging, and moisture tests. Stripped-down samples of cable show internal construction features. A different type of illumination, supplied by the incandescent lamp department, illuminates each bay to illustrate good industrial and commercial lighting.

Rubber Trade Inquiries

The inquiries that follow have already been answered; nevertheless they are of interest not only in showing the needs of the trade, but because of the possibility that additional information may be furnished by those who read them. The Editor is therefore glad to have those interested communicate with him.

No.	INQUIRY
2289	Manufacturer of sanitary vacuum bottle cap.
2290	Supplier of attached sheeting and single napped flannel.
2291	Manufacturer of cycle tire and tube machinery and equipment.
2292	Manufacturer of a machine for cutting old tires into strips for use in making door mats.
2293	Information wanted on treating rubber scrap whereby in only one operation the pure rubber is separated from cords, carbon, etc.
2294	Manufacturer of steel rule dies for cutting special shaped gaskets.
2295	Information wanted on electric heating of retreading apparatus.
2296	Information wanted on manufacturing Benzol rubber cement.
2297	Supplier of equipment for manufacturing Benzol rubber cement.

"1937 Show Supplement." Exhibitors Advisory Council, Inc., 330 W. 42nd St., New York, N. Y. Copies of the first supplement of the "1937 Schedule of Shows and Expositions" covering new listings of the exhibits in most of the industries, trades, and professions, are now available for general distribution at $2 each. This supplement contains approximately 400 new show listings giving the names, dates, and locations of these newly listed exhibitions. Among the classifications are boots and shoes, chemicals, textiles, and packaging.

ADVERTISING PAGES REMOVED

COMPOUNDING INGREDIENTS

THERE has been a very active demand during April due partly to covering against price advances and partly to production activity. The general opinion is that many prices will advance for the last six months of this year.

CARBON BLACK. Current demands are increasing owing to covering of contract prices which cover the first six months. The Akron district consumption is about equal to deliveries. New production units starting in May will increase the available supplies.

FACTICE. The demands for Factice continue steady. Higher prices may be expected because of the increase in the price of imported oils.

LITHARGE. The carload prices dropped to 7½ to 7¾¢, and the demand also dropped off slightly. This was due probably to heavy purchasing in March during the price advances. Prices started to decrease on March 23, with ½¢ per pound reduction.

LITHOPONE. Demand was steady with prices unchanged.

RUBBER CHEMICALS. The prices remained firm, and demand steady.

RUBBER SOLVENTS. Demand was heavy, particularly in the Akron area. No change in prices occurred last month.

STEARIC ACID. Business was fair, and prices were firm notwithstanding fluctuations in base materials.

TITANIUM PIGMENTS. Buying continued steady. No change was made in prices except Lead Titanate, which advanced.

ZINC OXIDE. There was heavy buying in the latter part of March by contract buyers to cover a price advance in mid-March. On April 9 prices on 35 and 50% leaded oxides dropped 0.525¢ and 0.750¢ respectively. There was no change in either 5% leaded oxide or lead-free oxides.

New York Quotations

April 27, 1937

Prices Not Reported Will Be Supplied on Application

Abrasive			
Pumicestone, powdered	lb.	$0.03	/$0.03¼
Rottenstone, domestic	lb.	.03	/ .03½
Silica, 15	ton	38.00	
Accelerators, Inorganic			
Lime, hydrated	ton	20.00	
Litharge (commercial)	lb.	.08½	
Accelerators, Organic			
A-1	lb.	.26	
A-5-10	lb.	.34	
A-10	lb.	.34	
A-11	lb.	.57	
A-19	lb.	.57	
A-32	lb.	.72	
A-77	lb.	.47	
Accelerator 49	lb.	.42	
808	lb.		
833	lb.		
Acrin	lb.		
Aldehyde ammonia	lb.		
Altax	lb.		
B-J-F	lb.		
Beutene	lb.		
Butyl Zimate	lb.		
C-P-B	lb.		
Captax	lb.		
Crylene	lb.		
Paste	lb.		
D-B-A	lb.		
Di-Esterex	lb.		
Di-Esterex-N	lb.		
DOTG	lb.	.47	
D.O.T.T.U.	lb.		
DPG	lb.	.37	
El-Sixty	lb.	.57	
Ethylideneaniline	lb.		
Formaldehyde P.A.C.	lb.		
Formaldehydeaniline	lb.		
Formaldehyde-para-toluidine	lb.		
Guantal	lb.	.40	/ .50
Hepteen	lb.		
Base	lb.		
Hexamethylenetetramine	lb.		
Lead oleate, No. 999	lb.	.13	
Witco	lb.	.13	
Methylenedianilide	lb.		
Monex	lb.		
Novex	lb.		
O. N. V.	lb.		
Ovac	lb.		
Pipsolene	lb.	1.75	
R-2	lb.	1.65	
Base	lb.	3.60	
R & H 50-D	lb.		
Safex	lb.		
Super-sulphur No. 1	lb.		
No. 2	lb.		
Tetrone A.	lb.		
Thiocarbanilide	lb.		
Thionex	lb.		
Trimene	lb.		
Base	lb.		
Triphenyl guanidine (TPG)	lb.		
Tuads	lb.		
Ureka	lb.	.65	
Blend B	lb.	.65	
C	lb.	.60	
Vulcanex	lb.		
Vulcanol	lb.		
Vulcone	lb.		
Z-B-X	lb.		
Z-88-P	lb.	.51	
Zenite	lb.		
A	lb.		
B	lb.		
Zimate	lb.		
ZML	lb.		
Activator			
Barak	lb.		
Age Resisters			
AgeRite Alba	lb.		
Exel	lb.		
Gel	lb.		
Hipar	lb.		
HP	lb.		
Powder	lb.		
Resin	lb.		
D	lb.		
Syrup	lb.		
White	lb.		
Akroflex C	lb.		
Albasan	lb.		
Antox	lb.		
B-L-E	lb.		
B-X-A	lb.		
Copper Inhibitor X-872	lb.		
Flectol B	lb.	$.054	
H	lb.	.54	
White	lb.	1.00	
M-U-F	lb.		
Neozone (standard)	lb.		
A	lb.		
C	lb.		
D	lb.		
E	lb.		
Oxynone	lb.	.68	
Parazone	lb.		
Perflectol	lb.	.67	
Permalux	lb.		
Santoflex A	lb.	.67	
Solux	lb.		
Thermoflex	lb.		
A	lb.		
V-G-B	lb.		
Alkalies			
Caustci soda, flake, columbia (400 lb. drums)	100 lbs	3.00	/$4.00
liquid, 50%	100 lbs.	2.25	
solid (700 lb. drums)	100 lbs.	2.60	/ 3.00
Antiscorch Materials			
Antiscorch T	lb.		
Cumar RH	lb.	.09	
Retarder B	lb.		
W	lb.		
T-J-B	lb.		
U.T.B.	lb.		
Antisun Materials			
Heliozone	lb.		
Sunproof	lb.		
Brake Lining Saturant			
B. R. T. No. 3	lb.	.0165/	.0175
Colors			
BLACK			
Lampblack (commercial)	lb.	.15	
BLUE			
Brilliant	lb.		
Prussian	lb.	.37½	
Toners	lb.	.08	/3.50
BROWN			
Mapico	lb.	.13	
GREEN			
Brilliant	lb.		
Chrome, light	lb.		
medium	lb.		
oxide (freight allowed)	lb.	$0.21	
Dark	lb.		
Guignet's, Easton, Pa., bbls.	lb.	.70	
Light	lb.		
Toners	lb.	.85	/$3.50
ORANGE			
Lake	lb.		
Toners	lb.	.40	/ 1.60
ORCHID			
Toners	lb.	1.50	/ 2.00
PINK			
Toners	lb.	1.50	/ 4.00
PURPLE			
Permanent	lb.		
Toners	lb.	.60	/ 2.00
RED			
Antimony			
Crimson, 15/17%	lb.	.50	
R. M. P. No. 3	lb.	.46	
Sulphur free	lb.	.48	
Golden 15/17%	lb.	.28	
7-A	lb.	.35	
Z-2	lb.	.22	
Aristi	lb.	1.75	
Cadmium, light (400 lbs. bbls.)	lb.	.70	
Chinese	lb.		
Crimson	lb.		
Mapico	lb.	.09¼	
Medium	lb.		
Rub-Er-Red, Easton, Pa., bbls.	lb.	.09¼	
Scarlet	lb.		
Toners	lb.	.08	/ 2.00
WHITE			
Lithopone (bags)	lb.	.04¼/	.04½
Albalith Black Label-11	lb.	.04¼/	.04¾
Astrolith (5-ton lots)	lb.	.04¼/	.04½
Azolith	lb.	.04¾/	.04½
Cryptone-19	lb.	.05¾/	.06¼
CB-21	lb.	.05¾/	.06¼
ZS No. 20	lb.	.09 /	.09½
No. 86	lb.	.09 /	.09½
Sunolith (5-ton lots)	lb.	.04¼	
Ray-Bar	lb.		
Ray-Cal	lb.		
Rayox	lb.		
Titanolith (5-ton lots)	lb.	.05¾	
Titanox-A (50-lb. bags)	lb.	.16 /	.16¾
B (50-lb. bags)	lb.	.05¾/	.06
B-30 (50-lb. bags)	lb.	.05¾/	.06
C (50-lb. bags)	lb.	.05¾/	.06
Ti-Tone	lb.		
Zinc Oxide			
Anaconda, Green Seal			
No. 333	lb.	.07½/	.08
Lead Free No. 352	lb.	.06 /	.06½
No. 570	lb.	.06 /	.06½
No. 577	lb.	.06 /	.06½
Red Seal No. 222	lb.	.07 /	.07½
U.S.P. No. 777 (bbls.)	lb	.06 /	.06½
White Seal No. 555	lb.	.08 /	.08½
Azo ZZZ-11	lb.	.06 /	.06¼
44	lb.	.06 /	.06¼
55	lb.	.06 /	.06¼
66	lb.	.06 /	.06¼
French Process, Florence White Seal-7 (bbls.)	lb.	.08 /	.08½

Green Seal-8 ..... lb. $0.07¼/$0.08
Red Seal-9 ..... lb. .07 / .07½
Kadox, Black Label-15 ... lb. .06¼/ .06¾
Blue Label-16 ..... lb. .06¼/ .06¾
Red Label-17 ..... lb. .06¼/ .06¾
No. 25 ..... lb. .07¼/ .07¾
Horse Head Special 3 .... lb. .06 / .06½
XX Red-4 ..... lb. .06 / .06½
23 ..... lb. .06 / .06½
72 ..... lb. .06 / .06½
78 ..... lb. .06 / .06½
80 ..... lb. .06 / .06½
103 ..... lb. .06 / .06½
110 ..... lb. .06 / .06½
St. Joe (lead free)
Black Label ..... lb. .06 / .06¼
Green Label ..... lb. .06 / .06¼
Red Label ..... lb. .06 / .06¼
U.S.P. X ..... lb. .09 / .09¼
White Jack ..... lb. .09 / .09¼

YELLOW
Cadmolith (cadmium yellow), 400 lb. bbls. ..... lb. .45
Lemon ..... lb.
Mapico ..... lb. .09½
Toners ..... lb. 2.50

Dispersing Agents
Bardol ..... lb. .0215/ .024
Darvan ..... lb.

Factice
Amberex ..... lb. .23
Brown ..... lb. .09 / .15
Neophax A ..... lb. .13½
B ..... lb. .13½
Fac-Cel B ..... lb. .16
C ..... lb. .16
White ..... lb. .10 / .16

Fillers, Inert
Asbestine, c.l., f.o.b. mills. ton 15.00
Barytes ..... ton 30.00
f.o.b. St. Louis (50 lb. paper bags) ..... ton 22.85
off color, domestic ..... ton 20.00 /25.00
white, imported ..... ton 29.00 /32.00
Blanc fixe, dry, precip. ..... lb. .03½/ .05
Calcene ..... ton 37.50 /45.00
Infusorial earth ..... lb. .02 / .03
Kalite No. 1 ..... ton
No. 3 ..... ton
Magnesia, calcined, heavy .. lb. .04
Carbonate ..... lb. .06½/
Pyrax ..... ton
Whiting
Columbia Filler ..... ton 9.00 /14.00
Domestic ..... 100 lbs.
Guilders ..... 100 lbs.
Hakuenka ..... lb.
Paris white, English cliff-stone ..... 100 lbs.
Southwark Brand, Commercial ..... 100 lbs.
All other grades ... 100 lbs.
Suprex, white extra light. ton 45.40 /60.00
heavy ..... ton 45.40 /60.00
Witco, c.l. ..... ton 7.00

Fillers for Pliability
P-33 ..... lb.
Thermax ..... lb.
Velvetex ..... lb. .03 / .04½

Finishes
IVCO lacquer, clear ..... gal. 1.00 / 2.25
colors ..... gal. 2.85 / 3.25
Rubber lacquer, clear ..... gal.
colored ..... gal.
Starch, corn, pwd. ..... 100 lbs.
potato ..... lb.
Talc ..... ton 25.00 /45.00

Flock
Cotton flock, dark ..... lb. .11½/ .14
dyed ..... lb. .50
white ..... lb. .14½/ .20
Rayon flock, colored ..... lb. 1.25 / 1.60
white ..... lb. 1.10

Latex Compounding Ingredients
Accelerator 85 ..... lb.
89 ..... lb.
122 ..... lb.
552 ..... lb.
Alphasol-OS ..... lb. .60
Antox, Dispersed ..... lb.
Aquarex A ..... lb.
D ..... lb.
F ..... lb.
Areskap No. 50 ..... lb. .20
No. 100, dry ..... lb. .43
Aresket No. 240 ..... lb. .18
No. 250, alcoholic ..... lb. .22
No. 300, dry ..... lb. .46
Aresklene No. 375 ..... lb. .40
No. 400, dry ..... lb. .56
Black No. 25, Dispersed .... lb. .22 / .40
Catalpo ..... ton
Color Pastes, Dispersed .... lb.
Dispersex No. 15 ..... lb. .80 / .95
No. 20 ..... lb. .60 / .75
Emo, brown ..... lb. .15
white ..... lb. .15
Factice Compound, Dispersed ..... lb. .40
Heliozone, Dispersed ..... lb.
Igepon A ..... lb.
MICRONEX, Colloidal .... lb. $0.06 /$0.07
Nekal BX (dry) ..... lb.
Palmol ..... lb. .10¾
Paradors ..... lb.
S.1. (50-55 gallon drums) .. lb. .65
Stablex A ..... lb. .80 / 1.10
B ..... lb. .40 / .90
C ..... lb. .30 / .50
Sulphur, Dispersed ..... lb. .10 / .15
No. 2 ..... lb.
T.1. (400 lb. drums) ..... lb. .40
Tepidone ..... lb.
Vulcan Colors ..... lb.
Zinc oxide, Colloidal ..... lb.
Dispersed ..... lb. .09 / .15

Mineral Rubber
B. R. C. No. 20 ..... lb. .009 / .01
Black Diamond ..... ton 25.00
Genasco Hydrocarbon, granulated, (fact'y) ... ton
solid ..... ton
Gilsonite Hydrocarbon (factory) ..... ton
Hydrocarbon, hard ..... ton
soft ..... ton
Parmr Grade 1 ..... ton 25.00
Grade 2 ..... ton 25.00
Pioneer ..... ton
265° ..... ton

Mold Lubricants
Mold Paste ..... lb. .18
Sericite ..... ton 65.00 /75.00
Soapbark ..... lb.
Soapstone ..... ton 25.00 /35.00

Oil Resistant
AXF ..... lb.

Reclaiming Oils
B. R. V. ..... lb. .03 / .0325
S. R. O. ..... lb. .0175/ .0185

Reenforcers
Carbon Black
Aerfloted Arrow Specification Black ..... lb. .0535/ .0825
Arrow Compact Granulized Carbon Black ..... lb.
"Certified" Heavy Compressed, Cabot ..... lb.
Spheron ..... lb.
Disperso, c.l. ..... lb. .0445/ .0535
Dixie, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex. ... lb. .0445
c.l., delivered New York. lb. .0535
local stock, bags, delivered ..... lb. .07½
Dixiedensed, c.l., f.o.b., New Orleans, La., Galveston or Houston, Tex. ... lb. .0445
c.l., delivered New York. lb. .0535
local stock, bags, delivered ..... lb. .07½
Dixiedensed 66, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex. ..... lb. .0445
c.l., delivered New York. lb. .0535
local stock, bags, delivered ..... lb. .07½
Excello, c.l., f.o.b. Gulf ports ..... lb. .0445/ .0645
delivered New York. lb. .0535/ .0735
l.c.l., delivered New York ..... lb. .07 / .08¼
Fumonex, c.l., f.o.b. works. lb. .03
ex-warehouse ..... lb. .04½
Gastex ..... lb. .03 / .07
Kosmobile, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex. ... lb. .0445
c.l., delivered New York. lb. .0535
local stock, bags, delivered ..... lb. .07½
Kosmobile 66, c.l., f.o.b New Orleans, La., Galveston or Houston, Tex. ..... lb. .0445
c.l., delivered New York. lb. .0535
local stock, bags, delivered ..... lb. .07½
Kosmos, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex. ... lb. .0445
c.l., delivered New York. lb. .0535
local stock, bags, delivered ..... lb. .07½
MICRONEX Beads, c.l., f.o.b. Gulf ports... lb. .0445
c.l., delivered New York ..... lb. .0535
local, stock, bags, delivered ..... lb. .07½
Mark II, c.l., f.o.b. Gulf ports ..... lb. .0445
c.l., delivered New York ..... lb. .0535
local, stock, bags, delivered ..... lb. .07½
Standard, c.l., f.o.b. Gulf ports ..... lb. .0445
c.l., delivered New
local, stock, bags, de-
York ..... lb. $0.0535
livered ..... lb. .07½
W-5, c.l., f.o.b., Gulf ports ..... lb. .0445
c.l., delivered New York ..... lb. .0535
local, stock, bags, delivered ..... lb. .07½
W-6, c.l., f.o.b., Gulf ports ..... lb. .0445
c.l., delivered New York ..... lb. .0535
local, stock, bags, delivered ..... lb. .07½
Pelletex ..... lb. .03 /$0.07
Supreme, c.l., f.o.b. Gulf ports ..... lb. .0445/ .0645
delivered New York.... lb .0535/ .0735
l.c.l., delivered New York ..... lb. .07 / .08¼
"WYEX BLACK" ..... lb.
Carbonex ..... lb. .029 / .0315
Carbonex "S" ..... lb. .0315/ .034
Clays
Aerfloted Paragon (bulk). ton 6.50
Suprex No. 1 Selected. ton 10.00
No. 2 Standard .... ton 9.00
China ..... ton 17.50 /20.00
Dixie ..... ton
Junior ..... ton
McNamee ..... ton
Par ..... ton
Witco ..... ton 9.00
Cumar EX ..... lb. .035

Reodorants
Amora A ..... lb.
B ..... lb.
C ..... lb.
D ..... lb.
Paradors ..... lb.
Rodo No. C ..... lb.
No. 10 ..... lb.

Rubber Substitutes
Black ..... lb. .07¾/ .13½
Brown ..... lb. .08½/ .14
White ..... lb. .09½/ .15¼

Softeners
Burgundy pitch ..... lb. .06
Cycline oil ..... gal. .20
Palm oil (Witco) ..... lb. .07
Pine tar ..... gal.
Plastogen ..... lb.
Reogen ..... lb.
Rosin oil, compounded .... gal. .40
RPA No. 1 ..... lb.
Rubtack ..... lb. .10
Tackol ..... lb. .115
Powder ..... lb.
Tonox ..... lb. .16
Witco No. 20 ..... gal. .18

Softeners for Hard Rubber Compounding
Resin C Pitch 55° C. M.P. ... lb. .0125/ .0135
Resin C Pitch 70° C. M.P. ... lb. .0125/ .0135
Resin C Pitch 85° C. M.P. ... lb. .0125/ .0135

Solvents
Beta-Trichlorethane ..... gal.
Bondogen ..... lb.
Carbon bisulphide ..... lb.
tetrachloride ..... lb.

Stabilizers for Cure
Laurex, ton lots ..... lb.
Stearic B ..... lb. .108 / .118
Beads ..... lb. .108 / .118
Stearic acid, single pressed. lb. .11½/
Stearite ..... 100 lbs. 10.50 /11.80
Zinc stearate ..... lb. .23

Synthetic Rubber
Neoprene Latex Type 50 ... lb.
53 ..... lb.
54 ..... lb.
Type E. ..... lb.
"Thiokol" A (f.o.b. Yardville) ..... lb. .35
Coating Materials ..... gal. 2.50 / 5.00
DX ..... lb. .55
Molding Powder ..... lb. .50 / .75

Tackifier
B. R. H. No. 2 ..... lb. .015 / .016

Varnish
Shoe ..... gal. 1.45

Vulcanizing Ingredients
Sulphur
Chloride, drums ..... lb. .03½/ .04
Rubber ..... 100 lb. 2.00
Telloy ..... lb.
Vandex ..... lb.
(See also Colors—Antimony)

Waxes
Carnauba, No. 3 chalky ... lb. .36 / .36½
2 N.C. ..... lb. .40 / .41
3 N.C. ..... lb. .37½/ .38
1 Yellow ..... lb. .46½/ .47
2 ..... lb. .45½/ .46
Montan, crude ..... lb. .11 / .11½

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COTTON AND FABRICS

NEW YORK COTTON EXCHANGE WEEK-END CLOSING PRICES

Futures	Feb. 27	Mar. 27	Apr. 3	Apr. 10	Apr. 17	Apr. 24
Mar.	13.03	.....	.....	.....	.....	.....
Apr.	12.89	14.22	14.53	13.98	.....	.....
May	.....	.....	14.46	13.93	13.39	13.25
July	12.52	13.96	14.30	13.80	13.32	13.24
Sept.	12.13	13.64	13.96	13.52	13.16	13.08
Dec.	11.95	13.45	13.74	13.28	13.00	12.95
Feb.	.....	.....	13.75	13.32	13.04	12.98

New York Quotations

April 27, 1937

Drills

38-inch 2.00-yard	yd.	$0.17⅜
40-inch 3.47-yard		.10½
50-inch 1.52-yard		.25
52-inch 1.85-yard		.21
52-inch 1.90-yard		.19¼
52-inch 2.20-yard		.18
52-inch 2.50-yard		.15¾
59-inch 1.85-yard		.19¾

Ducks

38-inch 2.00-yard D. F.	yd.	.17
40-inch 1.45-yard S. F.		.23½
51½-inch 1.35-yard D. F.		.25¼
72-inch 1.05-yard D. F.	.33	/.34¼
72-inch 17.21-ounce		.36

MECHANICALS

Hose and belting	lb.	.32

TENNIS

52-inch 1.35-yard	yd.	.26

Hollands

GOLD SEAL AND EAGLE

20-inch No. 72	yd.	.11
30-inch No. 72		.20
40-inch No. 72		.22

RED SEAL AND CARDINAL

20-inch	yd.	.09⅝
30-inch		.18
40-inch		.19¼
50-inch		.27

Osnaburgs

40-inch 2.34-yard	yd.	.12¾/.14⅜
40-inch 2.48-yard		.12⅛/.14⅛
40-inch 2.56-yard		.11¾
40-inch 3.00-yard		.11⅜
40-inch 7-ounce part waste		.11¾
40-inch 10-ounce part waste		.16⅛
37-inch 2.42-yard		.14½

Raincoat Fabrics

COTTON

Bombazine 60 x 64	yd.	.10¾
Plaids 60 x 48		.14¼
Surface prints 60 x 64		.15¾
Print cloth, 38½-inch, 60 x 64		.07¾

SHEETINGS, 40-INCH

48 x 48, 2.50-yard	yd.	.13
64 x 68, 3.15-yard		.13½
56 x 60, 3.60-yard		.11
44 x 40, 4.25-yard		.09

SHEETINGS, 36-INCH

48 x 48, 5.00-yard	yd.	.08⅛
44 x 40, 6.15-yard		.06¾

Tire Fabrics

BUILDER

17¼ ounce 60" 23/11 ply Karded peeler	lb.	.36½

CHAFER

14 ounce 60" 20/8 ply Karded peeler	lb.	.36½
9¼ ounce 60" 10/2 ply Karded peeler	lb.	.36

CORD FABRICS

23/3/3 Karded peeler, 1 7/32" cotton	lb.	.39½
15/3/3 Karded peeler, 1 7/32" cotton	lb.	.36½
23/5/3 Karded peeler, 1¼" cotton	lb.	.46
23/5/3 Combed Egyptian	lb.	.56

LENO BREAKER

8¼ ounce and 10¼ ounce 60" Karded peeler	lb.	.38½

THE accompanying table of week-end closing prices on the New York Exchange shows the change of representative futures during approximately the last two months. Spot middlings hovered around 15¢ from March 16 to April 7 and then started a gradual downward trend to 13.85¢ on April 20. Small declines were registered every day except one during the eleven-day period. Average prices at ten designated southern markets followed the trend, but trailed the New York Spot Middlings by 31 to 37 points.

According to the third canvass of farm opinion made by *The Journal of Commerce*, southern farmers expect to plant an area in cotton totaling 34,216,000 acres, an increase of 10.6% over the 30,932,000 acres planted to this crop last July 1. This estimated acreage for 1937 is due primarily to the generally increasing prices, and the increase over last year has jumped by 791,000 acres since the forecast by crop correspondents of *The Journal of Commerce* late in February.

Spurred on by Chairman Ellison D. Smith (S. C.) members of the Senate agriculture committee prepared on April 11 for early action on recommendations of its special subcommittee for widespread reforms in the existing cotton marketing system. However, on April 12 Chairman Smith stated that while the committee had approved the report with some modifications, legislation will be delayed for at least one year. This report ends two years of intensive investigation.

Culley A. Cobb, chief of AAA's southern division, pointed out in a special statement to borrowers that in view of present price levels farmers who have borrowed 12¢ per pound on their cotton from the C.C.C., may liquidate at a profit and that if this is done government-held cotton would cease to be a market factor.

On April 1, R.F.C. Chairman Jesse H. Jones announced that the government marketing program of marketing 12¢ loan cotton would be extended through April, subject to price change, terms or, conditions on five days' notice through the public press and R.F.C. agencies. Approximately 1,150,000 bales of cotton had been taken during February and March. It is reported that less than 2,000,000 bales of cotton remained under government loan as of April 1, 1937.

Fabrics

Cotton textile markets are at this writing exceptionally active as to shipments of goods under back contracts. New contract business is very quiet now, possibly because of heavy purchases during January, February, and early March and also because of a slackening off of consumption owing to labor disturbances during the past three months. Inventories of cotton textiles are low, and increased market activity as to new business is expected during May. The recent setback in cotton has served to bring it more in line with the selling prices of cotton fabrics. Prices on sheetings advanced from ¼ to ¾¢ per yard during April, but in general the prices on other fabrics used in the rubber industry have remained at the same level.

RUBBER SCRAP

THE demand for all grades of rubber scrap is very active, and consumption continues high. Prices increased considerably on most of the types during April: Boots and Shoes $2.50 per ton; No. 1 floating inner tubes remained unchanged, but increases on other tubes ranged from $7.50 to $10.00 per ton; tire scrap advances amounted to from $1.50 to $5.75 per ton; mechanicals remained at the same general level; and hard rubber scrap increases varied from $10.00 to $30.00 per ton.

CONSUMERS' BUYING PRICES

(Carload Lots Delivered Eastern Mills)

April 27, 1937

		Prices
Boots and Shoes		
Boots and shoes, black	lb.	$0.01¼/$0.01⅜
Colored	lb.	.00⅞/ .01
Untrimmed arctics	lb.	.01 / .01⅛
Inner Tubes		
No. 1, floating	lb.	.13½/ .14
No. 2, compound	lb.	.06¾/ .06¾
Red	lb.	.06½/ .06⅝
Mixed tubes	lb.	.05¾/ .06
Tires (Akron District)		
Pneumatic Standard		
Mixed auto tires with beads	ton	16.50 /17.00
Beadless	ton	23.50 /24.00
Auto tire carcass	ton	27.50 /30.00
Black auto peelings	ton	22.50 /25.00
Solid		
Clean mixed truck	ton	32.50 /35.00
Light gravity	ton	36.00 /37.00
Mechanicals		
Mixed black scrap	ton	25.00 /30.00
Hose, air brake	ton	31.00 /33.00
Garden, rubber covered	ton	16.50 /18.00
Steam and water, soft	ton	16.50 /18.00
No. 1 red	lb.	.03¾/ .04
No. 2 red	lb.	.03 / .03¼
White druggists' sundries	lb.	.04¾/ .05
Mechanical	lb.	.04½/ .04⅞
Hard Rubber		
No. 1 hard rubber	lb.	.15 / .17

Dividends Declared

Company	Stock	Rate		Payable	Stock of Record
Dunlop Rubber Co.	ADR for	Com. $0.327,	final	Apr. 26	Apr. 6
Dunlop Rubber Co., Ltd.	8%	Com.	final		
Dunlop Rubber Co., Ltd.	1%	Com.	extra		
Goodyear Tire & Rubber Co.		Com. $0.50		June 15	May 1
Goodyear Tire & Rubber Co.		Pfd. $1.25 q.		June 15	May 1
O'Sullivan Rubber Co.		Pfd. $0.37½ q.,	initial	Apr. 1	Mar. 16
Tyer Rubber Co.	6%	Pfd. $1.50 q.		May 15	May 10
U. S. Rubber Reclaiming Co.	8%	Pr. pfd. $0.50,	accum.	May 15	Apr. 30

SHAWMUT
HOSE AND BELTING DUCK

Fabrics for the Rubber Industries

We can give positive assurance of the performance of these famous industrial sheetings and hose and belting ducks. Our modern textile laboratories are available to assist rubber manufacturers in the development of fabrics to meet new industrial requirements.

WELLINGTON SEARS CO.
65 WORTH STREET NEW YORK, N. Y.

COLUMBUS SHEETINGS
60" 3.90 YD. 40 x 40

RECLAIMED RUBBER

United States Reclaimed Rubber Statistics—Long Tons

Year	Production	Consumption†	Consumption % to Crude	U. S. Stocks*	Exports
1934	110,010	100,597	22.3	23,079	4,737
1935	122,140	113,530	22.9	25,069	5,383
1936	150,571	130,048	22.6	30,573	7,085
1937					
January	15,129	13,366	27.4	31,610	857
February	15,192	13,485	26.8	32,817	946
March	14,462	15,393	29.1	30,277	...

*Stocks on hand the last of the month or year. †Corrected to 100% from estimate of reported coverage.
Compiled by The Rubber Manufacturers Association, Inc.

THE relation of supply and demand remains practically the same as during March. All operating plants are working to full capacity in an attempt to keep pace with orders. Because of contracts covering the first six months and a full booking of present orders activity in new orders has been very low, and during past months prices did not advance in proportion to increasing cost of labor and raw materials. Present prices have been adjusted upward in an attempt to take care of the greater cost of production, but they are for current delivery and do not necessarily represent prices for delivery on contracts during the last half of 1937.

New York Quotations

April 27, 1937

	Sp. Grav.	¢ per Lb.
Auto Tire		
Black Select	1.16-1.18	6½/ 6¾
Acid	1.18-1.22	7½/ 7¾
Shoe		
Standard	1.56-1.60	7½/ 7¾
Tube		
No. 1 Floating	1.00	19 /19¼
Compounded	1.10-1.12	11 /11¼
Red Tube	1.15-1.30	11 /11½
Miscellaneous		
Mechanical Blends	1.25-1.50	4½/ 5
White	1.35-1.50	15 /15½

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

British Malaya

An official cable from Singapore to the Malayan Information Agency, Malaya House, 57 Trafalgar Sq., London, W.C.2, England, gives the following figures for March, 1937:

Rubber Exports: Ocean Shipments from Singapore, Penang, Malacca, and Port Swettenham

To	Sheet and Crepe Rubber Tons	Latex, Concentrated Latex, Revertex, and Other Forms of Latex Tons
United Kingdom	5,895	439
United States	29,962	797
Continent of Europe	12,285	486
British possessions	3,752	105
Japan	4,979	56
Other countries	805	7
Totals	57,678	1,890

Rubber Imports: Actual, by Land and Sea

From	Dry Rubber Tons	Wet Rubber (Dry Weight) Tons
Sumatra	7,337	2,258
Dutch Borneo	2,587	27
Java and other Dutch islands	488	13
Sarawak	1,412	...
British Borneo	584	25
Burma	722	34
Siam	2,501	1,069
French Indo-China	146	230
Other countries	133	13
Totals	15,910	3,669

World Net Imports of Crude Rubber

Year	U.S.A.	U.K.	Australia	Belgium	Canada	Czechoslovakia	France	Germany	Italy	Japan	Russia	Rest of the World	Total
1934	439,100	158,500	9,600	9,100	28,400	11,000	50,400	59,300	21,400	69,900	47,300	60,500	964,500
1935	455,800	128,800	10,000	7,600	26,900	11,200	52,300	62,900	26,100	57,600	37,600	57,100	933,900
1936	475,361	6,785	14,423	9,627	27,867	8,772	56,828	71,793	17,000	61,701	30,967	59,847	827,401
1936													
Jan.	33,260	4,573	1,260	760	1,758	767	6,770	5,545	1,500*	4,357	467	5,121	66,138
Feb.	33,789	1,271	735	779	1,900	344	6,288	5,257	1,000*	3,305	94	5,268	60,030
Mar.	33,743	1,227	819	1,033	1,809	410	4,342	4,568	1,000*	5,172	4,376	5,433	61,478
Apr.	44,949	2,097	969	1,097	1,079	603	4,261	5,497	1,500*	4,931	3,251	4,723	70,763
May	35,549	302	1,053	698	2,221	667	4,342	4,639	1,000*	5,531	4,220	4,380	64,602
June	35,901	1,493	1,693	579	2,042	323	4,860	5,698	1,500*	4,567	2,427	4,176	62,273
July	38,556	766	1,455	713	2,274	495	4,631	6,837	2,000*	5,126	1,733	4,532	67,586
Aug.	41,094	1,581	762	789	3,780	989	4,522	6,536	1,500*	4,305	3,128	4,259	70,103
Sept.	49,483	12	2,336	513	2,393	624	4,402	6,006	1,500*	5,197	2,922	5,159	80,523
Oct.	40,301	87	1,124	817	3,110	1,026	4,423	7,232	1,500*	6,602	2,761	5,509	74,318
Nov	37,898	742	997	1,090	4,308	823	3,289	6,300	1,500*	3,934	2,162	5,681	67,440
Dec.	50,838	4,926	1,220	759	1,193	1,701	4,698	7,458	1,500*	8,674	3,500	5,606	82,147
1937													
Jan.	42,655	242	590	854	1,632	567	4,440	7,041	2,000*	8,298	2,633	5,562	76,030

*Estimate. Source: *Statistical Bulletin of the International Rubber Regulation Committee.*

Shipments of Crude Rubber from Producing Countries

Year	Malaya including Brunei and Labuan	N.E.I.	Ceylon	India	Burma	North Borneo	Sarawak	Siam	French Indo-China	Philippines and Oceania Total	Oceania	Africa	South America	Mexican Guayule	Grand Total
1934	467,400	379,400	79,100	6,500	6,300	11,100	17,700	17,700	19,600	1,004,800	1,400	3,500	9,100	400	1,019,200
1935	417,000	282,900	54,300	9,100	4,900	8,900	19,500	28,300	28,700	853,600	1,500	5,000	12,200	500	872,800
1936	353,667	309,641	49,685	8,666	5,859	8,177	21,237	34,578	40,830	832,340	1,619*	6,095	14,632	1,228	855,914
1936															
Jan.	26,637	20,778	4,178	419	886	938	2,317	1,665	2,449	60,261	105	494	1,796	70	62,726
Feb.	19,692	27,991	3,664	871	511	529	2,107	3,663	2,894	61,922	225	620	1,177	75	64,019
Mar.	34,597	19,403	4,336	750	574	342	1,848	2,966	2,553	67,369	133	535	1,175	40	69,252
Apr.	21,667	25,255	3,172	413	817	869	2,053	1,596	2,416	58,258	92	533	1,044	103	60,030
May	34,108	22,121	2,560	632	485	517	2,354	2,077	2,282	67,136	103	493	1,018	88	68,838
June	25,115	26,401	3,766	673	553	461	1,386	3,737	2,733	64,825	153	456	947	97	66,478
July	34,214	33,911	3,773	1,048	311	1,035	1,399	3,734	2,738	82,163	155	423	1,013	96	83,850
Aug.	30,253	25,313	3,940	655	121	656	2,541	3,284	3,017	69,780	162	444	681	146	71,213
Sept	34,160	21,835	5,367	588	76	537	1,139	3,259	3,505	70,466	164	508	1,070	106	72,314
Oct.	33,591	28,777	5,599	809	372	1,086	2,143	3,349	3,874	79,600	162	593	1,287	114	81,756
Nov.	30,549	30,476	4,960	607	698	701	1,950	2,260	3,872	76,073	64	396	1,663	159	78,355
Dec.	29,084	27,380	4,370	1,201	461	506	....	2,988	8,497	74,487	101	600*	1,761	134	77,083
1937															
Jan.	24,746	27,122	4,514	498	579	1,234	4,063	3,849	2,828	69,433	100*	500*	1,286	140*	71,519
Feb.	24,138	26,755	5,619	1,047	843	790	2,043	3,554	3,089	67,878	100*	500*	1,789	150*	70,417

*Estimate. Source: *Statistical Bulletin of the International Rubber Regulation Committee.*

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
Light face type $1.00 per line (ten words)	Light face type 40c per line (ten words)	Light face type 75c per line (ten words)
Bold face type $1.25 per line (eight words)	Bold face type 55c per line (eight words)	Bold face type $1.00 per line (eight words)
Allow nine words for keyed address.		*Replies forwarded without charge.*

SITUATIONS WANTED

RUBBER THREAD EXPERT, WITH MANY YEARS' practical experience in development and manufacture of fine cut thread for corsets, bathing suits, etc., desires change. Would like to contact established rubber company or webbing mill interested in installing department for manufacturing this profitable product. Willing to invest some capital. Address Box No. 805, care of INDIA RUBBER WORLD.

EXPERIENCED COMPOUNDER AND CHEMIST, DESIRES POSITION as research compounder, or development work. Ten years' experience, including wide variety of rubber products. Would also be interested in position as superintendent of small plant. Address Box No. 810, care of INDIA RUBBER WORLD.

FOOTWEAR, MILL AND CALENDER ROOM FOREMAN, WITH 26 years' experience, thoroughly understanding compounding and mixing, desires change. Address Box No. 811, care of INDIA RUBBER WORLD.

CHEMICAL ENGINEER: COMPETENT YOUNG MAN WITH NINE years' compounding and factory practice experience in rubber footwear, bands, extruded goods and sponge, at present employed, desires to make a change. Address Box No. 816, care of INDIA RUBBER WORLD.

SITUATIONS OPEN

RUBBER CHEMIST AND FACTORY MANAGER FOR MANUFACturer making mechanical rubber goods, sponge rubber, and extruded rubber. Please reply stating experience and salary expected. Address Box No. 806, care of INDIA RUBBER WORLD.

SALESMEN WANTED: A MODERNLY EQUIPPED RUBBER plant near New York City manufacturing molded rubber goods, sponge rubber products, etc., at competitive prices, has openings for two good salesmen who have followings. Commission basis. Advise in complete detail. Address Box No. 807, care of INDIA RUBBER WORLD.

SITUATIONS OPEN—Continued

WANTED: ENGINEER TO WORK ON V-BELTS. COMPREHENsive knowledge of belt construction, development, and manufacture required. Must be thoroughly familiar with modern industrial and automotive belt practices. In answering, state experience, education and references. Address Box No. 808, care of INDIA RUBBER WORLD.

RUBBER TECHNICIAN, WITH 2 to 5 YEARS' EXPERIENCE IN manufacture of rubber products for research and editorial work. Give full details experience, age and salary. Address Box No. 817, care of INDIA RUBBER WORLD.

RUBBER CHEMICAL SUPPLY HOUSE DESIRES TO engage for sales work three young men with technical training and experience in the rubber industry. Address Box No. 818, care of INDIA RUBBER WORLD.

BUSINESS OPPORTUNITIES

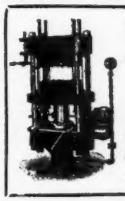
DURAL RUBBER CORPORATION, FLEMINGTON, NEW JERSEY. Entire plant for sale: Brick building, 10,000 feet floor space, 2½ acres, city and independent water system, railroad siding, equipment including 2 mixing mills, 1 calender, 2 Royle tubers, 1 Adamson tuber, 7 inner tube De Mattia watch case presses, 14 inner tube De Mattia watch case molds, 5 hydraulic presses, 2 hand presses, 2 automatic washer cutters, 2 vulcanizing steel chambers, several lathes, dies, molds, etc., 1 100 h.p. boiler, 2 75 h.p. motors, 1 30 h.p. motor, 1 10 h.p. motor, 8 miscellaneous motors, air compressor complete (Ingersoll-Rand), low and high pressure hydraulic pumps, electric washer, office equipment, etc., etc.

FOSTER D. SNELL, INC.
Chemists—Engineers
Every form of Chemical Service
305 Washington Street **Brooklyn, N. Y.**
215 N. Calvert Street, Baltimore, Maryland

INTERNATIONAL PULP CO.
41 Park Row, NEW YORK, N. Y.
SOLE PRODUCERS
ASBESTINE
REG. U. S. PAT. OFF.

Precipitated Surinam Balata
For golf ball manufacturers. Approximately 99% deresinated. Dependable deliveries. You also avoid fire or explosion hazard. Purer and cheaper than you can make it. Sample and price on request.
HUNTINGDON MANUFACTURING CO.
MEADOWBROOK, PA.

MECHANICAL MOLDED RUBBER GOODS
We Solicit Your Inquiries
THE BARR RUBBER PRODUCTS COMPANY
SANDUSKY, OHIO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Plain or Semi-automatic—Any Size or pressure—Pumps, Valves, etc.
Dunning & Boschert Press Co., Inc.
336 W. WATER ST. SYRACUSE, N. Y.

We Have a Completely Equipped Plant for Manufacturing
RUBBER SPECIALTIES
Backed by years of experience.
Let us quote on your requirements without obligation, of course.
ADMIAR RUBBER CO.
273 Van Sinderen Ave., Brooklyn, N. Y.
Division of Ideal Novelty & Toy Co., Inc.
Long Island City, New York

SUMMIT
AIR OPERATED PRESSURE CONTROLLER
Will maintain constant pressure being sensitive to less than ¼ lb. Rugged and easily adjusted with independent knurled knob. Comes complete with 3 gauges. May be changed quickly from direct to reverse action. Eight models ranging from 1 to 500 lbs. for vuleanizers, platen presses.
Write for descriptive matter and prices.
INDUSTRIAL INSTRUMENT CO., 96 E. Miller Ave., AKRON, O.

(*Advertisements continued on page* 95)

Rubber Goods Production Statistics

		1937	1936
TIRES AND TUBES*		Jan.	Jan.
Pneumatic casings			
Production	thousands	....	4,579
Shipments, total	thousands	....	3,875
Domestic	thousands	....	3,802
Stocks, end of month	thousands	....	8,918
Inner tubes			
Production	thousands	....	4,592
Shipments, total	thousands	....	4,168
Domestic	thousands	....	4,111
Stocks, end of month	thousands	....	8,623
Raw material consumed			
Fabrics	thous. of lbs.	....	19,738
MISCELLANEOUS PRODUCTS			
Single and double texture proofed fabrics			
Production	thous. of yds.	3,884	2,645
Rubber and canvas footwear			
Production, total	thous. of prs.	5,898	5,925
Tennis	thous. of prs.	2,418	2,174
Waterproof	thous. of prs.	3,480	3,751
Shipments, total	thous. of prs.	6,018	6,144
Tennis	thous. of prs.	2,639	2,061
Waterproof	thous. of prs.	3,379	4,083
Shipments, domestic, total	thous. of prs.	5,954	6,109
Tennis	thous. of prs.	2,603	2,042
Waterproof	thous. of prs.	3,351	4,067
Stocks, total, end of month	thous. of prs.	13,454	14,886
Tennis	thous. of prs.	5,108	6,839
Waterproof	thous. of prs.	8,346	8,047

*Data for January to July, 1935, are estimated to represent approximately 97% of the industry; for August, September, October, November, and December, 1935, the coverage is estimated to be 81%.

Source: *Survey of Current Business*, Bureau of Foreign & Domestic Commerce, Washington, D. C.

Foreign Trade Information

For further information concerning the inquiries listed below address United States Department of Commerce, Bureau of Foreign and Domestic Commerce, Room 734, Custom House, New York, N. Y.

EXPORT OPPORTUNITIES

No.	COMMODITY	CITY AND COUNTRY
*2,217	Druggists' sundries	London, England
†2,646	Handles, hard rubber, bakelite or horn.	Monterey, Mexico
†2,716	Crude rubber	Buenos Aires, Argentina
*2,724	Merchandise for 5, 10, and 20¢ stores	Paris, France
†2,726	Adhesive plasters	Medan, Sumatra
*2,754	Sporting goods	Oshawa, Canada
¶2,767	Bathing accessories and hot water bottles	Brussels, Belgium
*2,768	Gum rubber articles, rubberized fabric specialties, and articles of synthetic rubber	Vienna, Austria
*2,781	Hospital and druggists' sundries	Lisbon, Portugal
*2,796	Rubber goods manufacturing machines	Buenos Airs, Argentina
*2,799	Sporting goods, tennis, golf, and baseball	Johannesburg, South Africa
¶2,807	Merchandise for 5 and 10¢ stores	Brussels, Belgium
*2,815	Rubber goods	Weyburn, Canada
†2,821	Elastic webbing	Brampton, Canada
¶2,853	White rubber belts	Montreal, Canada
*2,854	Surgical gloves	Lima, Peru
†2,858	Batiste, rubberized	Znaim, Czechoslovakia
¶2,860	Corset Materials (elastic sides and triangular inserts)	Prague, Czechoslovakia
*2,863	Druggists' sundries	Cairo, Egypt
†2,865	Rubber treating machines for manufacture of plastic materials	Blere, France
¶2,890	Rubber goods	Cairo, Egypt
*2,904	Rubber sheets	Calcutta, India
*2,912	Surgical and hospital rubber supplies.	Lourenco Marques, Portuguese East Africa
†2,944	Rubberized cardboard sheets for shoe counters	Fougeres, France
¶2,982	Rubber bands	Cairo, Egypt

IMPORT OPPORTUNITIES

163	Raw rubber	Tokyo, Japan

*Agency. †Purchase. ¶Purchase and agency.

U. S. Crude and Waste Rubber Imports for 1937

	Plantations	Latex	Paras	Africans	Centrals	Manicoba and Guayule	Matto Grosso	Totals 1937	Totals 1936	Balata	Miscellaneous	Waste
Jan. ....tons	30,674	1.171	625	167	23	160	..	32,820	31,292	13	383	201
Feb.	40,326	2,100	717	15	2	129	..	43,289	35,219	37	1,300	217
Mar.	48,367	2,117	1,285	47	11	212	..	52,039	37,451	21	894	572
Total, 3 mos., 1937 ....tons	119,367	5,388	2,627	229	36	501	..	128,148	.....	71	2,577	990
Total, 3 mos., 1936 ....tons	98,008	3,705	1,537	419	108	185	..	.....	103,962	175	2,155	448

Compiled from The Rubber Manufacturers Association, Inc., statistics.

United States Latex Imports

Year	Pounds	Value
1934	29,276,134	$3,633,253
1935	30,358,748	3,782,222
1936	44,469,504	6,659,899
1937		
Jan.	2,995,027	535,546
Feb.	4,418,474	775,202

Data from Leather and Rubber Division, United States Department of Commerce, Washington, D. C.

Rims Approved by The Tire & Rim Association, Inc.

Rim Size	3 Mos., 1937 No.	%	3 Mos., 1936 No.	%
Drop Center Rims, 16" Diameter and Under				
16x4.00D	1,563	0.0	188	0.0
16x4.25D	148,336	2.4	84,215	1.7
16x4.50D	931	0.0	5,712	0.1
15x3.00D	22,850	0.4	12,112	0.3
15x5.00F	.....	..	502	0.0
15x5.50F	45,475	0.7	33,394	0.7
16x3.50D	696,943	11.0	.....	..
16x4.00E	2,457,522	39.0	1,784,510	35.8
16x4.25E	261,114	4.1	99,452	2.0
16x4.50E	1,067,566	16.9	672,166	13.5
16x5.00F	265,016	4.2	217,951	4.4
16x5.50F	33,371	0.5	21,365	0.4
16x6.00F	8,755	0.1	5,489	0.1
Drop Center Rims, 17" Diameter and Over				
17x3.00D	2,957	0.0	29,132	0.6
17x3.25E	5,338	0.1	200,053	4.0
17x3.62F	7,770	0.1	760,972	15.3
17x4.00F	.....	..	10,807	0.2
17x4.19F	959	0.0	3,212	0.1
17x5.00F	3,089	0.0	2,724	0.1
18x2.15B	4,295	0.1	8,111	0.2
18x3.25E	2,701	0.0	2,928	0.1
18x3.62F	9,989	0.2	.....	..
18x4.00F	141	0.0	.....	..
18x4.19F	6,086	0.1	4,850	0.1
19x2.15B	1,405	0.0	2,803	0.1
19x3.00D	2,703	0.0	3,043	0.1
19x3.25E	269	0.0	1,643	0.0
19x3.62F	3,383	0.1	.....	..
20x3.25E	5,208	0.1	3,915	0.1
21x3.25E	3,152	0.0	.....	..

Rim Size	3 Mos., 1937 No.	%	3 Mos., 1936 No.	%
Flat Base Passenger Rims				
All Sizes	4,787	0.1	7,769	0.2
High Pressure Rims				
All Sizes	.....	..	.....	..
15" Truck Rims				
15x7	1,120	0.0	1,172	0.0
15x8	92	0.0	259	0.0
18" Truck Rims				
18x6	1,455	0.0	.....	..
18x7	11,441	0.2	11,008	0.2
18x8	1,390	0.0	723	0.0
18x9/10	1,724	0.0	320	0.0
20" Truck Rims				
20x5	356,103	5.6	336,828	6.8
20x6	556,725	8.8	474,839	9.5
20x7	125,919	2.0	74,081	1.5
20x8	60,190	1.0	34,813	0.7
20x9/10	8,580	0.1	4,509	0.1
20x10.50	.....	..	222	0.0
20x11	711	0.0	408	0.0
22" Truck Rims				
22x7	61	0.0	.....	..
22x8	5,206	0.1	4,045	0.1
22x9/10	873	0.0	741	0.0

Rim Size	3 Mos., 1937 No.	%	3 Mos., 1936 No.	%
24" Truck Rims				
24x6	198	0.0	344	0.0
24x7	922	0.0	2,426	0.0
24x8	5,267	0.1	5,738	0.1
24x9/10	4,112	0.1	2,300	0.0
24x11	115	0.0	610	0.0
Drop Center Tractor Rims				
24x6.00S	6,851	0.1	1,300	0.0
24x8.00T	20,040	0.3	10,860	0.2
28x6.00S	101	0.0	416	0.0
28x8.00T	16,018	0.3	7,130	0.2
32x6.00S	.....	..	1,052	0.0
32x8.00T	1,253	0.0	.....	..
36x6.00S	21,347	0.3	18,621	0.4
36x8.00T	14,334	0.2	2,849	0.1
40x6.00S	5,909	0.1	1,494	0.0
42x8.00T	216	0.0	.....	..
18x5.50F	570	0.0	.....	..
20x4.50E	4,330	0.1	.....	..
20x5.50F	1,566	0.0	.....	..
21x3.00D	881	0.0	.....	..
22x4.50E	871	0.0	.....	..
36x4.50E	226	0.0	.....	..
Cast Rims				
10x5.00F	777	0.0	250	0.0
10x6.00F	213	0.0	62	0.0
15x2.50D	158	0.0	.....	..
24x15Y	121	0.0	42	0.0
Clincher Rims				
All Sizes	539	0.0	281	0.0
Totals	6,312,199	..	4,978,761	..

Classified Advertisements

Continued

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FOR SALE: THREE 40" MILLS, IN GOOD CONDITION, WITH individual drives and motors. Martin Rubber Co., Inc., Long Branch, N. J.

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United States Statistics

Imports for Consumption of Crude and Manufactured Rubber

	January, 1937		January, 1936	
	Pounds	Value	Pounds	Value
UNMANUFACTURED—*Free*				
Crude rubber	94,083,922	$15,408,242	72,250,414	$8,624,060
Liquid latex	2,995,027	535,546	3,733,665	474,682
Jelutong or pontianak	552,567	56,056	1,468,433	133,948
Balata	22,616	4,348	65,677	8,924
Gutta percha	283,140	52,017	344,435	54,678
Guayule	358,500	44,166	156,000	13,182
Scrap and reclaimed	1,874,387	20,280	*827,600	*14,545
Totals	100,170,159	$16,120,655	78,846,224	$9,324,019
Chicle, crude—*Free*	1,460,410	$422,485	471,259	$120,633
MANUFACTURED—*Dutiable*				
Rubber tires—*number*	5,351	$13,983	663	$794
Rubber boots, shoes, and overshoes—*pairs*	3,832	2,221	1,595	1,800
Rubber soled footwear with fabric uppers—*pairs*	74,847	14,124	61,355	16,914
Golf balls—*number*	4,560	1,150	4,080	969
Lawn tennis balls—*number*	61,394	4,811	70,488	6,051
Other rubber balls—*number*	681,468	24,458	195,725	7,939
Other rubber toys, except balls	46,675	6,715	107,184	13,507
Hard rubber combs—*number*	75,600	4,437	25,020	1,696
Other manufactures of hard rubber	.....	5,041	.....	1,131
Friction or insulating tape	9,300	545	24,650	1,146
Belts, hose, packing, and insulating material	.....	4,418	.....	8,745
Druggists' sundries of soft rubber	.....	5,359	.....	7,865
Inflatable swimming belts, floats, etc.—*number*	147,751	9,175	2,616	215
Other rubber and gutta percha manufactures—*lb.*	111,765	21,290	103,053	16,635
Totals	.....	$117,727	.....	$85,407

Exports of Foreign Merchandise

RUBBER AND MANUFACTURES				
Crude rubber	1,890,008	$372,053	1,639,483	$229,129
Balata	57,159	15,374	8,123	1,887
Gutta percha, rubber substitutes, and scrap	4,210	1,282	32,152	422
Rubber manufactures	.....	2,235	.....	293
Totals	.....	$390,944	.....	$231,731

Exports of Domestic Merchandise

RUBBER AND MANUFACTURES				
Reclaimed	1,918,592	$87,750	1,281,945	$55,190
Scrap	1,554,801	48,346	3,452,246	73,058
Cements—*gal.*	21,335	18,084	16,519	13,418
Rubberized automobile cloth, *sq. yd.*	48,266	21,932	23,520	11,124
Other rubberized piece goods and hospital sheeting—*sq. yd.*	126,406	50,857	66,601	27,540
Footwear				
Boots—*pairs*	12,029	27,110	7,219	18,127
Shoes—*pairs*	13,325	8,616	7,346	4,298
Canvas shoes with rubber soles—*pairs*	15,534	9,269	14,192	7,754
Soles—*doz. prs.*	4,489	7,722	1,361	2,592
Heels—*doz. prs.*	63,058	35,190	41,756	27,454
Soling and top lift sheets	34,362	5,836	66,763	11,270
Gloves and mittens—*doz. prs.*	6,353	12,822	2,694	6,928
Water bottles and fountain syringes—*number*	15,039	4,785	11,702	4,559
Other druggists' sundries	.....	37,242	.....	32,625
Gum rubber clothing—*doz.*	24,547	39,279	13,553	9,283
Balloons—*gross*	28,962	20,209	24,625	21,038
Toys and balls	.....	6,050	.....	2,858
Bathing caps—*doz.*	2,912	4,735	2,362	4,415
Bands	19,952	7,735	21,419	7,318
Erasers	30,780	17,939	22,123	13,810
Hard rubber goods				
Electrical battery boxes	26,875	5,581	.....	15,690
Other electrical—*lb.*	36,165	10,649		
Combs, finished—*doz.*	5,587	3,453	.....	16,392
Other hard rubber goods	.....	17,797		
Tires				
Truck and bus casings, *number*	18,112	350,378	14,883	296,609
Other automobile casings, *number*	61,517	609,902	51,791	464,808
Tubes, auto—*number*	53,567	85,018	50,431	81,148
Other casings and tubes, *number*	4,354	36,806	1,692	7,172
Solid tires for automobiles and motor trucks—*number*	340	8,948	370	13,059
Other solid tires	115,654	16,390	70,751	11,143
Tire sundries and repair materials	.....	78,222	.....	39,581
Rubber and friction tape	74,240	19,749	53,259	12,181
Fan belts for automobiles—*lb.*	42,212	25,481	195,318	99,923
Other rubber and balata belts—*lb.*	177,554	91,832		
Garden hose—*lb.*	59,892	15,153	385,006	114,875
Other hose and tubing—*lb.*	416,118	138,410		
Packing	138,854	59,667	133,148	50,446
Mats, matting, flooring, and tiling	82,055	14,731	97,483	10,917
Thread	98,304	43,633	157,560	63,978
Gutta percha manufactures	135,157	32,614	8,129	5,471
Other rubber manufactures	.....	127,535	.....	111,982
Totals	.....	$2,263,457	.....	$1,770,034

*Including Siak.

Dominion of Canada Statistics

Imports of Crude and Manufactured Rubber

	Twelve Months Ended December, 1935		Twelve Months Ended December, 1936	
	Pounds	Value	Pounds	Value
UNMANUFACTURED				
Crude rubber, etc.	60,188,210	$6,955,077	62,421,709	$9,510,701
Gutta percha	26,541	15,767	16,893	8,957
Rubber, recovered	8,068,500	380,671	10,135,800	451,406
Rubber, powdered, and gutta percha scrap	2,798,600	41,177	3,592,900	52,466
Balata	13,834	3,385	14,295	4,016
Rubber substitute	453,200	124,937	464,700	125,034
Totals	71,548,885	$7,521,014	76,646,297	$10,152,580
PARTLY MANUFACTURED				
Hard rubber comb blanks	.....	$15,581	.....	$8,491
Hard rubber	24,320	19,226	57,068	39,314
Hard rubber tubes	.....	5,152	.....	3,412
Rubber thread not covered	47,002	30,179	53,605	35,386
Totals	71,322	$70,138	110,673	$86,603
MANUFACTURED				
Belting	.....	$81,355	.....	$87,933
Hose	.....	80,764	.....	94,459
Packing	.....	64,141	.....	62,933
Boots and shoes—*pairs*	558,799	373,161	191,873	81,042
Canvas shoes with rubber soles—*pairs*	.....	.....	110,390	39,514
Clothing, including waterproofed	.....	18,689	.....	24,635
Raincoats—*number*	8,359	31,753	17,222	50,717
Gloves—*dozen pairs*	2,426	7,356	3,444	8,415
Hot water bottles	.....	15,097	.....	18,055
Liquid rubber compound	.....	11,408	.....	22,299
Tires, bicycle—*number*	52,276	21,628	57,960	23,843
Pneumatic—*number*	16,961	158,602	15,438	168,741
Inner tubes—*number*	3,218	8,402	4,520	9,234
Solid for automobiles and motor trucks—*number*	409	12,876	310	11,306
Other solid tires	.....	6,981	.....	8,062
Mats and matting	.....	114,556	.....	86,811
Cement	.....	87,260	.....	62,060
Golf balls—*dozens*	37,097	99,658	35,945	90,685
Heels—*pairs*	77,779	4,646	74,144	4,755
Other rubber manufactures	.....	781,276	.....	1,089,506
Totals	.....	$1,979,609	.....	$2,045,005
Totals, rubber imports	.....	$9,570,761	.....	$12,284,188

Exports of Domestic and Foreign Rubber Goods

	Produce of Canada Value	Reexports of Foreign Goods Value	Produce of Canada Value	Reexports of Foreign Goods Value
UNMANUFACTURED				
Waste rubber	$58,735	.....	$108,751	.....
MANUFACTURED				
Belting	$551,729	.....	$576,855	.....
Canvas shoes with rubber soles	1,315,990	.....	1,182,460	.....
Boots and shoes	2,249,675	.....	3,545,289	.....
Clothing, including waterproofed	181,166	.....	270,451	.....
Heels	194,675	.....	189,904	.....
Hose	167,045	.....	205,626	.....
Soles	230,996	.....	180,416	.....
Tires, pneumatic	6,507,805	.....	6,709,480	.....
Not otherwise provided for	503	.....	103	.....
Inner tubes	478,213	.....	632,832	.....
Other rubber manufactures	580,874	$16,455	612,472	$23,349
Totals	$12,458,671	$16,455	$14,105,888	$23,349
Totals, rubber exports	$12,517,406	$16,455	$14,214,639	$23,349

Imports by Customs Districts

	February, 1937 *Crude Rubber		February, 1936 *Crude Rubber	
	Pounds	Value	Pounds	Value
Massachusetts	13,385,743	$2,371,277	5,261,758	$654,898
St. Lawrence	1,090	207	.....	.....
New York	53,733,112	9,404,963	62,825,460	8,015,668
Philadelphia	2,232,823	378,102	1,025,398	130,640
Maryland	3,894,034	664,619	948,751	112,688
Mobile	685,390	110,921	334,212	37,347
New Orleans	2,173,975	354,474	868,965	99,442
Los Angeles	22,672,026	3,702,398	5,731,317	652,668
San Francisco	941,283	153,897	67,300	8,512
Oregon	4,480	672	22,400	2,863
Ohio	.....	.....	1,027	97
Washington	239,510	41,605	.....	.....
Chicago	123,252	20,190	.....	.....
Colorado	536,170	99,551	.....	.....
Totals	100,622,888	$17,302,876	77,086,588	$9,714,823

*Crude rubber including latex dry rubber content.